atomic

MAXIMUM POWER COMPUTING
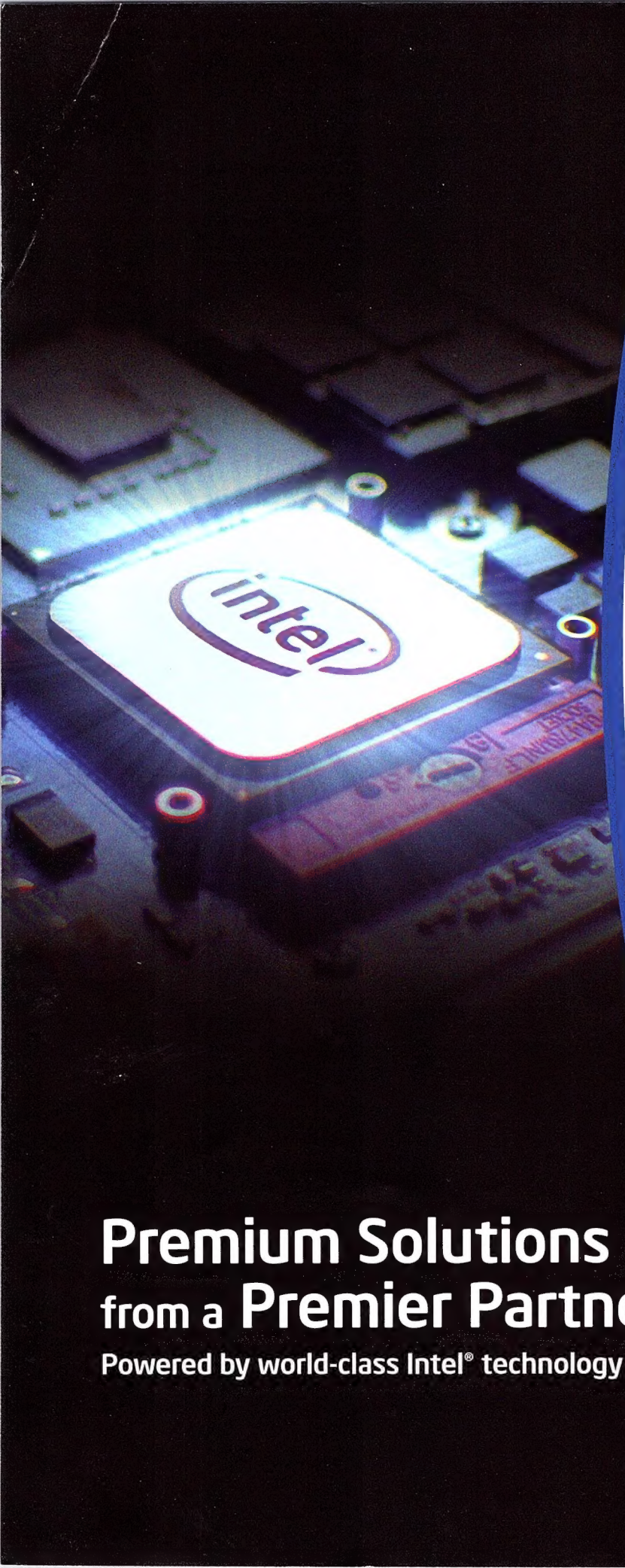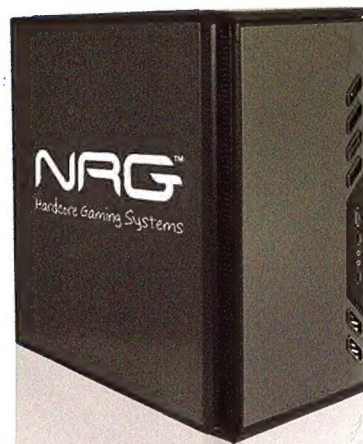
NRG™
Hardcore Gaming Systems

STORM i7

Intel® Core™ i7 965 Quad Core processor,
at 3.2GHz OC up to 4.0Ghz
Intel® X58 motherboard
Corsair 6GB 1600Mhz DDR3
Dual NVIDIA® GeForce™ GTX 295 1792MB GDDR3
2 Terabyte RAID 0 HDD storage
Alphacool water cooling system
Antec TruePower quattro 1000 watt

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Your technical
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Core™ 2
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Do More

EDHEAD

It's finally here.

100 issues of Atomic. And boy have we got a great issue to celebrate with.

First up, this issue is packed to the green gills with everything that we love. Want hardware? We've got it in spades, from graphics cards to PC cases to CPUs and more. Want games? They're here, with reviews, dissections of DirectX 11 and more. Learning? There's case modding and educational stuff. Like I said, it's incredibly packed.

But it wouldn't be much of collector's issue if there wasn't something to collect. That's why we've got a very special poster for you. To anyone who's been a part of the forums, it should be pretty obvious what we've done – and hopefully pretty damn cool. If you're not a forum goer, though, the Atomic poster in this issue is made up of some of the classic user avatars that Atomicans have used over the last few years.

Oh, and special thanks to Dan Godden, one of Haymarket's Interactive guys, and Phil Vella, in Publishing. Dan slaved away over the hot pixels that make up the poster, while Phil carefully went through the nearly 6,000 avatars that make up the poster to keep out all the naughty bits – and there were a *lot* of naughty bits.

It's a symbol of what makes Atomic great – its readers.

I've also been in touch with all the old Editors of the mag, going back to Ben Mansill, and gotten them to write special columns about what Atomic means to them – there's a lot of history when you've been around for 100 issues, and these are the guys that made it possible.

And don't forget our special Atomic Challenge – a *special* competition on p.43 that could win you a custom built monster PC from Anyware and Thermaltake.

Finally, we have the results of our big Hot 100 Poll – the 100 coolest games, tech manufacturers, articles, writers and community moments ever. This is the list to end all Atomic lists, and I had a real hoot going through and compiling it all, working out what makes you, the readers, tick.

So here it is. The 100th issue – one of the best issues I think I've ever produced, in any job.

Enjoy.

David Hollingworth
dhollingworth@atomicmpc.com.au

SUB-ATOMIC FOR $60!! pg1

May

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pg 42

Sony charges for PS3 bandwidth

Content publisher to carry the cost of demo downloads.

In the console wars there have been many points of contention, and one of the main ones in this latest generation has been internet connectivity. Namely, that Sony doesn't charge for theirs while Microsoft does.

A massive drawback to this free gaming service on Sony's side is not just the confusion that some users go through when attempting to find other friends in a multitude of friends lists, but that the bandwidth costs are not absorbed by a subscription fee.

Every gigabyte of data that was previously downloaded in the form of a demo or trailer was paid for by Sony to host and transfer, while Microsoft had all their costs factored in to the 360's Gold membership service.

In a very radical move, Sony has sent a memo out to the publishers, and have stated that they're being charged a whopping sixteen cents per gigabyte downloaded!

This is only going to hurt PS3 gamers in the long run, as publishers will be less likely to publish even free content on the service when it costs them as well as developing/marketing the games proper.

Military prototype: 100 Kilowatt laser

So much more pew-pew!

Lasers have been the weaponry of choice for the sci-fi realm for, well, as long as sci-fi weapons have been around, mainly due to their awesome coolness factor.

Apart from being a very novel application of energy, they're deadly precise, and in most cases powerful enough to blast a hole clean through a slab of metal – but we haven't had access to that technology for real, until now.

The awkwardly named Joint High Power Solid State Laser, or JHPSSL, has an activation time of less than one second from an off state, can operate for up to five minutes of beaming, and is incredibly scalable.

It is a modular design that allows the simple addition of extra battery cells and other components to increase the power level – all the way up to 100kW.

Just to give an idea of how much power this is, a single kilowatt is equal to 1000 watts, and an average household will use a single kilowatt

of power in a whole day. The JHPSSL is a thousand thousand watts of power focused into a intense beam, or 100,000 watts.

One hundred thousand watts of power. Zap.

There are some hurdles however, and this huge amount of power being shuffled around also means a lot of heat. Efficiency currently stands at only 19.3 per cent, meaning that over four fifths of the electricity used is turned into heat, which needs to be dissipated elsewhere.

The good news is that the tech is so modular it can eventually be worked and tweaked down into a mobile truck form (though not at the full 100kW), and can potentially be used to hit fast-moving aerial targets such as missiles, mortars or possibly even grenades with exceptionally pinpoint accuracy.

It's all incredibly exciting tech, and laser weaponry might make its way to the battlefield in the next couple of decades – just make sure you're not in the way when they're fired.

THQ ditches devs
Feeling the pinch.

Times are tough all over, and while the game industry is doing better than some, there still those who are hurting in the hip pocket. The latest to feel the global financial pinch is publisher THQ, who has announced that unless it can find a buyer soon, it will be shutting down Big Huge Games. The pending shut-down - and let's be honest, it's probably going to go that way - comes on the back of THQ's announcement that it's setting free two other developers to find their own way. Both Incinerator Studios and Heavy Iron Studios are now roaming free to find other financial backing on their own terms; whether or not that's possible, for studios better known for television tie-ins, is debatable.

NVIDIA has already been found guilty of renaming their G92-based cores from the 9x00 series in the mobile department, to the Gxx0 series - even though they're the same core. All signs had pointed to them wanting to do exactly the same in the desktop space too - changing the 9800GT's name to GTS240. As sick as we are of this dodgyness, the vendors are sick of it too - not only do they have to make the cards proper, but all the packaging and discounting of the older names mean that their profits fall sharply. They kicked up a stink about it, and NVIDIA finally agreed to give it a rest, instead splitting the 9800GT into three SKUs; the standard one, a Green version with lower core voltage and power consumption, and an overclocked model.

We've all used silicon, and more specifically semiconductors made from silicon in our daily lives. Silicon has a limit though, and eventually we're going to need a replacement technique or material to get our computing done faster - and that's where Quantum computing steps in. Instead of using a positive/negative charged semiconductor to calculate and process work, scientists can instead use the quantum binary digits (known as qubits) to represent and perform the same function faster. Not only is the speed of the switching faster when using qubits, but they can also hold multiple values - you can do a whole lot more with less space. While we're not sure just how overclockable a qubit is, it's going to be a whole lot of fun finding out!

Introducing... R.U.S.E.

Ubisoft's latest and greatest RTS - with a twist.

You gotta hate it when game companies announce great looking new titles along with vague release dates – and that's Ubisoft and Eugen System's new RTS, R.U.S.E.

"Ubisoft is known for innovation and R.U.S.E. continues that tradition, offering the most immense and detailed maps ever seen in an RTS," said Ubisoft's Marketing Director, John Parkes about the game's announcement. "Players can explore the maps using the IRISZOOM Engine, which provides an aerial, smooth interaction unlike anything ever seen before."

Certainly, the game is already looking intriguing, with one early trailer suggesting incredible levels of environmental detail at all levels of zoom. The game's saddled with a release date 2009/2010, but in the meantime, we've got some great screenshots to share.

[1. General] [Atomic]: DING! 100!

[1. General] [Blizzard]: GRATZ!

GEARBOX
All the best and coolest gadgets and gear.

1. Linksys Media Hub
Price $650 Website www.linksysbycisco.com

Ah, the digital home, the dream of nerdy technophiles since the mid nineties. Sadly, it's never quite arrived as it was originally conceived – a gleaming white palace full of ethereal holograms telling you how good you look.

But what we do have, is Linksys' new Media Hub, a 500GB, network attached storage device that is sleek stylish and – most importantly – really simple to use.

It plugs into your router, most conveniently, and then with the installation of some software every PC or Mac in your house can access it. You can even access the device via the web, and download material – got a great new show you want to share with a friend? This is the perfect way. It even connects to mobile devices and game consoles. The idea is nothing new, but making it work so simply is Neato!

We'd still kinda like those holograms though.

2. Sumo Omni
Price $199 Website www.sumolounge.com

There are few things better than reclining in comfort and playing your favourite game. And there are few things more comfy than these super-giant Omni beanbags.

It's not just filled with those annoying old foam beads – this puppy's packed to perfection with SUMO BEADS. Makes all the difference. It can be folded, spindled and downright mutilated into all kinds of positions – recline on it, sit in it... hell, even straddle it! The Omni is made from space age and apparently rip proof nylon, and we think it'll even come off pretty well in the age old fight between seating contrivance and pizza.

3. JSB Triple Action Foot Switch
Price from $US149 Website www.kinesis-ergo.com

The name might be kinda dull, but the idea is also kinda neat.

This device plugs into your PC and provides a whole new way to interact with your machine – with your feet! It's perfect for all kinds of professionals and would be ideal for gaming...

Okay, we've got to honest. What we really think this is perfect for is putting the boot in in passionate flame wars. At last, you'll be able to put your foot down in style!

Though, seriously, mapping Crouch and Sneak to these things would rock for a moody FPS...
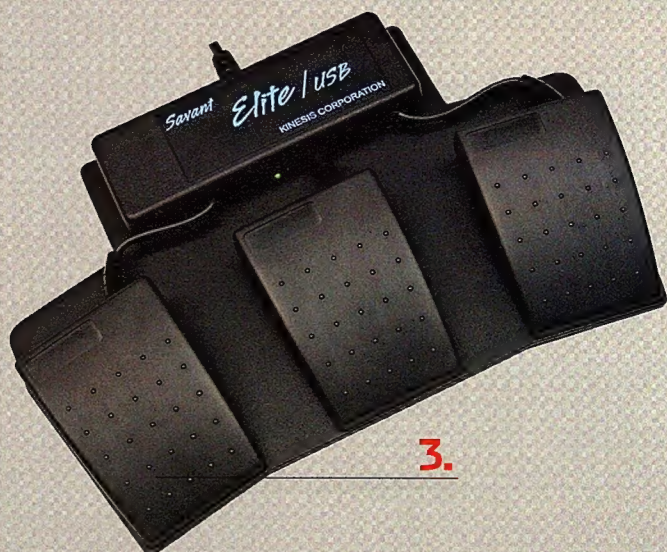
1.

2.

3.

Experience Superlative Gaming Performance

ENGTX295/2DI/1792MD3
- New Generation 55nm Dual GPU solution
- Gigantic 1792MB memory on board
- Native HDMI output support

ENGTX285 UL/HTDI/1GD3
- 10% faster than generic GTX285
- Gigantic 1GB memory on board
- HDMI output support

ENGTX285 TOP/HTDI/1GD3
- 105% speed compared w/ generic GTX285
- Gigantic 1GB memory on board
- HDMI output support

ENGTX285/HTDP/1GD3
- New Generation 55nm GPU solution
- Gigantic 1GB memory on board
- Graphics Plus PhysX Technology

Hole in the wall

The firewall is an essential bastion of internet security, but what's not well known is that all firewalls have an Achilles heel. **Ashton Mills** pings the ports.

Firewalls are the first line of defence for any network connected PC. And, usually, the more the merrier – having them at the gateway, the router, and on every individual PC on the network helps to ensure no nasties come knocking on your silicon door.

And they couldn't be simpler. While once upon a time a firewall was a static, binary allow/deny wall of defence, modern firewalls are different. Blanket allow and deny rules are effective, but not terribly practical – every time you ran a program that wanted to access the net on a non-standard port, you would need to explicitly open that port. And then, even if it was no longer in use, it would remain open unless you explicitly closed it.

Thus was borne the *stateful* firewall, an intelligent packet-analysing firewall that tracks packets going out to determine what to allow in – responses to any connections originated on the inside are automatically passed through. Ports don't need to be opened or closed, just exceptions based on the traffic to and from a specific machine.

All firewalls, at least at the consumer level in routers and security software, are stateful. They provide a fire-and-forget solution to ensuring a machine remains locked down with the exception of the traffic it generates itself. And it's a very effective solution.

But therein lies the Achilles heel as well.

Man on the inside

Because a stateful firewall allows in any traffic generated by programs going out, there's an implicit expression of trust at play – obviously, all the traffic leaving the machine must be legitimate. It has to be, because inherently the firewall can't tell good traffic from bad.

So what happens if a malicious program gets on a machine, and happily starts transmitting your keystrokes to a hacker in Russia? Why, it allows it through – because it has no way of knowing it wasn't the user that wanted to contact that .ru domain.

This is what spurred the evolution of personal firewalls, the type of which you can get standalone or as part of a security suite today. On top of the basic stateful firewall, these firewalls take the extra step of assuming that not all traffic originating from a machine is necessarily legitimate, and so implement internal checks – at the very least to query the user with 'This program wants to access the net, do you want me to allow it?'

You would think this should be relatively foolproof, as a user can easily answer whether the program in question really is one they started or not. But what this means is that for a malicious program to bypass the firewall, all it has to do is pretend it's the user.

There's another problem with this too, as invariably some programs will automatically be allowed access by any security suite, because they're considered essential: Windows Update for example, or the program's own services. Additionally, a user is going to grow tired very

Attacks on the inside

A good source of example programs to test various methods of bypassing firewalls can be found at **www.firewallleaktester.com**. The programs here are proof of concept and safe to try out – some firewalls do well at picking up their tricks, while others fail dismally. In the end, because the exploits revolve around abusing the inherent trust of firewall software with the user, and like viruses the methods for doing this continually evolve, there's no guaranteed solution to this Achilles heel.

Firewall Leakage Tester v1.2

Firewall Penetrated!
When you are connected to the Internet press the "Test For Leaks" button to begin.

Firewall Penetrated!

LeakTest WAS ABLE to connect to the main GRC.COM Web Server!

LeakTest **was not prevented** from connecting to the Gibson Research web server. You either have no firewall, you have deliberately allowed LeakTest to connect outbound, or (if neither of those), LeakTest has just slipped past your firewall's outbound "protection", if any.

v1.2, Copyright (c) 2002 by Gibson Research Corp.   Help   Test For Leaks

that's already allowed through. And this is exactly what some malware attempts to do.

Most of today's advanced firewall suites cannot stop a nasty application from emulating another program and gaining unrestricted access to the net – to do things like transmit your keystrokes, or send other data gleaned from the system for identity theft.

The smart ones don't try and emulate one or two programs, they'll have an internal list of many and try each one until it gets through. The *really* smart ones will highjack programs and use techniques like DLL or thread injection to either directly alter a running program, or create a 'clone' of an application (such as Explorer itself) that kills the original instance and launches the new one with a modified DLL.

These are attacks from the inside out, and there's not a lot that security programs and their firewalls can do about it – because there are two factors at play: first any hijacked programs pass through the firewall because the firewall is doing exactly what you tell it to – let through

quickly of being prompted to allow their browser through everytime they launch it, so they're going to tick 'Add to exclusion list' quick-smart.

Which means malicious software doesn't need to force access and bypass a firewall, all it has to do is pretend it's one of the programs

These are attacks from the inside out, and there's not a lot that security programs and their firewalls can do about it.
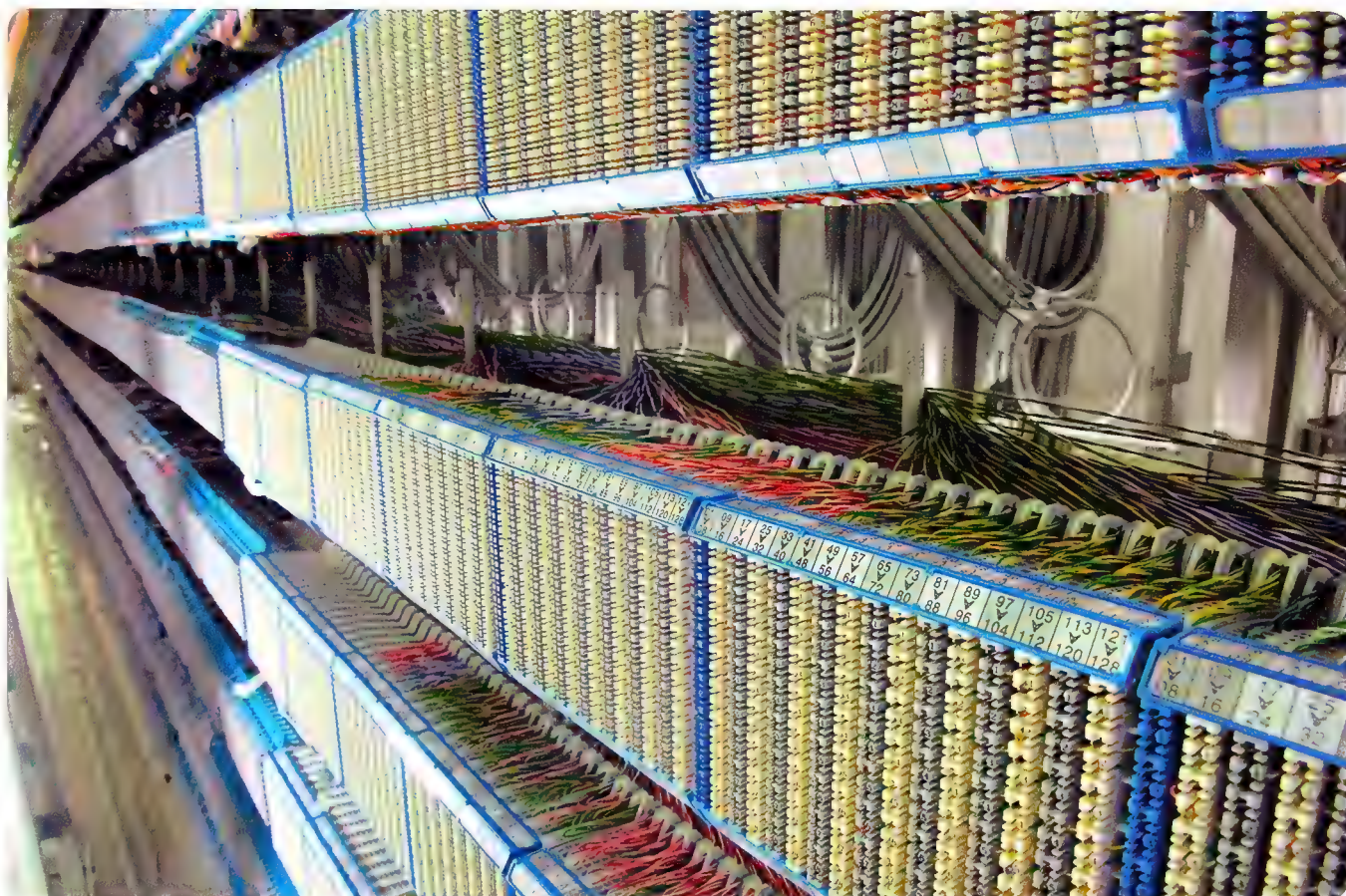
States of a wall

Firewalls aren't just passive defenders, they can be helpful or downright rude. When another machine attempts to connect to or ping a port, the firewall has three ways to respond:

• If the port is *open*, let the request though.

• If the port is *closed*, be polite and inform the host the port is closed.

• Don't respond at all, and silently *drop* the packet into the void.

When you run firewall tests on the web to ping your machine (such as Shields Up! at **https://www.grc.com/x/ne.dll?bh0bkyd2**), they will often report which ports are open, closed, or *stealthed*. The latter is just a fancy way of saying the program doesn't actually now what's there. Because the packets are dropped, there is no response from your machine, and bar the fact you requested a test to your particular IP your machine would otherwise appear non-responsive on the net – the safest option of all. While a firewall that responds a port is closed is polite netiquette, it means anyone trying to access you machine at least knows your machine is, indeed, there and thus could try other means of gaining access. Generally, use a firewall that stealths your machine (and your router may already do this).

...the single greatest security threat to any computer – the fleshbag using it...

reality, that the single greatest security threat to any computer and any network isn't malware, viruses, or trojans – it's the fleshbag sitting between chair and keyboard. The *only* way malicious software ever spreads so rapidly and so expansively on the net is thanks to users – users who open unknown attachments, click on flashy and annoying pop-ups, and who download anything they're prompted to.

If there is one reliable variable about malware, it's that it can only be dangerous if it's allowed on a system.

Part of the problem, which Vista tried to improve and hopefully Windows 7 will get right, is that under the hood Windows makes the assumption that the user knows best (which is kind of ironic, considering how the interface assumes a user to be computer illiterate). The user can always get administrative (sometimes through prompts) access to the machine. It only takes a user to incessantly click 'Yes' to allow a program to run for malware to gain a foothold.

You don't necessarily need to run an overly-protective firewall if you're not going around installing everything that pops up on your screen, but you might be better informed than friends and family, so educate them about the social engineering techniques some malware can use to get onto machines – "No, that free virus checker you were prompted to download really *isn't* a virus checker, no matter how many flashing pop-ups told you otherwise!"

In the end, no matter how good a firewall can be, the security of a machine is dependent on its user. In a perfect world, a stateful firewall is all anyone should need. But the proliferation of malware suggests otherwise.

'trusted' programs, including those the user themselves has allowed. Secondly, because the very foundation of Windows assumes the user is an expert – and given administrative access on-demand – security programs and firewalls are again bound by the level of trust implicit in a user's authority. A user's 'copy' of Internet Explorer for example is considered trusted, even if it's been hijacked.

The solution many personal firewalls work with is to look for trojan code when a 'trusted' application accesses the net. Either the code itself shows up in its database of malicious software, or an MD5 sum or similar is compared against the database of known programs. Neither of these methods are foolproof, and so while some security suites can catch some of these wolves in sheep's clothing, none can be completely effective, and they're only as up to date – like virus scanners – as their signature files.

And that's the rub, a firewall is no silver bullet. There is, however, something much better: common sense.

Prevention > cure

It's common knowledge, and an unfortunate

atomic

When the man

Founding Editor **Ben Mansill** looks back on why Atomic came to be, who it serves, and what makes an Atomican.

There's a lot to like about Atomic, but what I think it all boils down to is that PC and gaming technology is sexy, beautiful and exciting. We made a magazine that embraced that passion, and lo and behold, it was instantly seized upon by a great big bunch of most excellent folks who agreed, and for the first time, could flock together and with giddy excitement, shouting it loud and proud.

Until Atomic, the other computer magazines, which we all read as we grew up, had the gear and reported on it fairly and squarely. But, to me and so many others, there seemed to be an unspoken rule that those writers and editors worked hard to make it as boring as possible. There was an academic restraint. It was an unappealing world of butt-ugly covers and layouts, and Larry the Labcoat staff and readers. The fun and excitement of technology was routinely sucked out, and the culture could never develop. Bugger that. Technology is outrageously cool, let's play with it, push it til it breaks and have some silly fun with it all!

It all came together at a perfect time, with exactly the right people, for an audience busting at the seams ready for it. AJB Publishing, the company that launched Atomic, had a few runs on the board with a more traditional mag – PC Authority, and was ready to have a go with a less-safe project that threw the rules out the window. It was a risk, in that an entire magazine like this had never been done, but looking at the publishing scene now, where everybody is trying to think of niches within niches, Atomic and what it was all about was a big green supernova ready to burst.

The closest thing to Atomic, pre-Atomic, were the tech pages in the back of games mags. PC gamers know what matters. CPUs, videocards, motherboards. We hated beige cases, we thought heatsinks were beautiful. If we could eat a video card, we would. We tweaked graphics settings and the end result was a feeling of satisfaction not far off feeling we were one with the machine, could feel its components and almost by sheer force of empathy, push them to the limit. It was all grounded in performance, of course. A

decent FPS, really, when you strip it all away to the basics.

But we weren't 'Framerate Monthly'. Folks who dig chips and boards, and the amazing game graphics that come from that, also dig a wider circle of related stuff, so we did consoles, supercomputers, weapons systems and simulators. We encouraged

the formative modding scene, freeing so many people from the old constrictive ideas that PCs which were sexy and cool inside, could and should be outrageously beautiful on the outside. Pride and passion where it hadn't been before.

We took stuff apart, we voided warranties like

our lives depended on it. We overclocked when it was a dirty word. In the beginning, Intel and AMD were terrified to give us a new CPU. Intel in particular were not keen on overclocking, nor were most motherboard companies. Some went as far as to ask us not to try and overclock during a review. We did anyway. They thought it

We overclocked when it was a dirty word. In the beginning, Intel and AMD were terrified to give us a CPU.

was a passing fad in a very small group. Look at them now! Look at the off-the-shelf case mod market now. Being part of Atomic is sitting at the bleeding edge. It's living a couple of years in the future, but not caring whether or not the rest of the world ever catches up.

comes around

What Atomic did, for which we're all so proud, is give a voice and an identity to many wonderful people at a time it was needed. You called yourselves 'Atomicans', right from the beginning. That wasn't a name we thought of, or would have occurred to us to do. That alone is a powerful testament to what this is all about. It's fair to say that Atomic inspired many people, young and old, to take pride in their passion, and to push it to the highest limits.

Such a thrilling idea simply had to look equally as exciting. So we went all out with the design. All the way along, our designers embraced the same attitude the boys in the labs did. It had to be the best, going hard and doing groovy stuff for the very first time. We went batshit mental with the covers. It was frozen. It was burning. It was underwater. It was beautiful. The cover symbolised what we were all about.

Atomic today is a wonderful maturity of those years of beautiful insanity. It is everything the early staff could ever have dared wish it would become. It is classy, stylish and funny. It looks amazing. It pushes and prods boundaries with part scientific method, and part 'what the hell, let's just try it' fun.

I hope that you, as a reader, have always felt welcome in these pages. That, perhaps, when you saw Atomic for the first time, something clicked, or exploded in your head, and a place where you belong was ready for you. That you are one of us because you are a gamer, and technologist, an explorer of new ways to do things, and you can have a laugh about it all.

Atomic has been inspired all the way by people like you. Your calls and emails, hanging out together at meets or events and the unbelievable energy in the forums have always fed the fires of the team. Atomicans proudly turning up at the office, so excited to show us their modded case, or some incredible invented device. That's what it's all about. Atomic, from day one, has always been one vast collective of readers and writers, sharing a love of good technology, and the pleasure of sharing ideas and excitement with each other as one damn sexy family.

INPUTOUTPUT

Dan Rutter brings the answers to your questions like no-one else can.

I/O OF THE MONTH

Chuck another drive on the barbie

I I am wondering about 'secure data erasure' schemes. The Gutmann Method, for instance, purportedly overwrites data 35 times with varying junk data patterns.

A quicker alternative, the US DoD 5220-22.M method, only overwrites it 7 times, and is therefore considered less 'secure'.

Why isn't replacing all the data just once enough? Surely if the hard-drive (or whatever) is filled entirely with 0s, or 1s or a random combination thereof, you shouldn't be able to recover any of the original data at all, should you?

Alex Jordan

O The basic idea is that when data is overwritten only once, the fuzzy blobs of new data bits deposited on top of the fuzzy blobs of old data bits may allow some of the old data to peek out around the sides. There's no way to recover that data with an ordinary computer, but it's barely conceivable that you could do it by removing the drive's controller board and connecting the moving parts to more sensitive hardware.

(I talked about this in this old I/O column: **www.dansdata.com/io009.htm**)

The 35 passes of the full Gutmann method are, as Peter Gutmann is perfectly happy to explain, much more than you need to erase any kind of data to the point where you can quite confidently bet your life that nobody can recover it.

I/O OTM
WINS A LOGITECH G5!
There's a mouse in the house. Okay, it's not in the house, it's in I/O. And it looks damn good.

The reason why it's much more than you need is that the Gutmann sequence includes several different kinds of overwriting, each for a different kind of drive. It includes, for instance, a special overwrite flavour for MFM ST-506 drives, from when 10MB was a lot of disk space.

Gutmann's fancy overwrite strategies are a waste of time if you're trying to wipe data on a current drive. All you need to do to achieve maximum data obliteration, on a modern drive that uses Extended Partial Response Maximum Likelihood to tease ones and zeroes out of the minuscule signal from the read heads, is overwrite with fairly-random data a few times.

Even after you do this, it's still barely possible that someone might be able to read the data back. They'd probably have to extract the platters and attack them with a massive magnetic force microscope or something, though.

But this would be a very major undertaking. Physicists are divided about whether it'd even be possible. It could well be easier for an attacker to just kill everybody in your building and make it look like an accident than for them to recover twice-overwritten deleted data.

generator, and can build up quite large static charges. Even modern cleaners with direct-drive impellers are going to build up some charge, though, just from the air rushing through the tube. You could probably make a static-safe vacuum cleaner by using a metal tube – possibly with no attachment on the end – and earthing the tube, but I haven't tried that.

Modern vacuums that have truly variable

Sandblasting's fine, though

I Is vacuuming the inside of a desktop or laptop computer a Good Idea or is it considered harmful?

On the one hand getting rid of the absurd amounts of dust is obviously good. On the other hand, lots of pages warn of the generated static electricity. Another blog recently warned that the spinning fans might act as generators and induce a big computer-killing current.

In the past my solution has always been

propping up the open case in an open window and just blowing as hard as I can. Of course the case hanging halfway outside the window is just a terrible freak accident waiting to happen.

Moritz Schallaböck

O Vacuum cleaners are indeed bad for PCs, and yes, it's mainly because of the static electricity, as I mention in my ancient How To Destroy Your Computer piece: **www.dansdata.com/sbs3.htm.**

Old-fashioned belt-drive vacuum cleaners actually work as pretty good Van de Graaff

Just as good as an air duster, until your hand cramps up.

atomic

suction should actually work very nicely for cleaning computers if you can deal with the static problem, and are careful. I'm sure you can also buy intrinsically 'ESD safe' vacuum cleaners. I'd only bother going down this path if I had to clean out a lot of computers, though.

What I suggest you try is a more refined version of your out-the-window technique.

Take the computer outside, and blow the dust out of it with a can of air duster, or for almost as good an effect, one of those big 'rocket' puffer bulbs (as mentioned in **www.dansdata.com/gz057.htm**). Or do it inside, and just take the computer away after you've finished blowing it clean, and vacuum the floor where it was.

If you're using air duster, bear in mind that you can indeed destroy fans (though not the computer itself) with anything that can spin a fan much faster than it's meant to go, in either direction. People cleaning computers with air-duster can easily do this to a CPU-cooler fan.

When two UPSes love each other very much...

I I've got two cheap and dirty line-interactive UPS units. One is 650VA, and of vaguely acceptable quality. Let's call this Sam.

The other is supposedly 1400VA, yet of rotten quality, so that it will not switch to battery in time when a brownout occurs. Let's call this one Al.

I have a PC, an LCD monitor and an ADSL modem/router, all of which I want to be able to use through power outages lasting 20-40 minutes. My problem is:

Al, even though it has supposedly adequate capacity for this task, won't switch to battery power fast enough, so I end up with a freshly reset PC every time the mains is out.

Sam, on the other hand, intervenes on time, but is helpless after 15 minutes.

I developed two theoretical, yet untried to date, solutions:

The first is to connect Sam and Al in series – Al to the wall, Sam to Al, PC and other stuff to Sam. This should work, I suppose, yet there might be two issues: First, I don't know if I isolate Sam and hence the PC from earth in this setting, and second, connecting UPS units in series is not the most power-efficient way to use them.

The second solution would be to connect both Al and Sam to the wall, and connect their outputs in parallel to the PC. However, I am not sure if this is safe.

Separating the pieces, i.e. connecting the PC to Sam and the LCD and modem to Al in a sort of load-balancing setup is not an option because my Core 2 Duo and GeForce 8something sucks enough power to bleed poor Sam dry in less than 20 minutes.

What would you suggest apart from getting a decent new UPS, though I know that is the sensible way to go?

Cagri Ozturk

O Both of your theoretical solutions are, I'm afraid, asking for trouble.

Connecting the UPSes in series may actually work, for suitably small values of 'work', but as a general rule it's a bad idea to connect power-protection devices in series. It's not the UPS features that are a problem here, and you ought to have an OK earth too, but the surge-protection stuff could have difficulties.

(The most diverting version of this idea is several UPSes connected in a circle, all clicking away like crazy until one dies.)

Your UPSes-in-parallel idea, in contrast, will lead to instant disaster. You'd have the output of one UPS driving the input of the other during switch-over, and they'd be outputting slightly out-of-sync AC in mains mode (because of phase-shifting by protection hardware) and very out-of-sync AC in battery mode (because they've got no mains reference to sync to, then). And there are probably other things wrong with it too that I haven't figured out yet.

So what do I suggest, apart from getting a decent new UPS? Get a lousy new UPS!

Usually the only thing wrong with old UPSes is that their battery is dead, which I've firmly established (**www.dansdata.com/upsupgrade.htm**) is eminently curable. And if you can get a seller on eBay or wherever to remove the old dead batteries from a used UPS before they send it to you, even the shipping shouldn't be very expensive.

If I were you, I'd ditch the more-powerful UPS with the switch-over problem, and run the less-powerful UPS from bigger batteries with the same voltage as its stock ones. And, if the less-powerful UPS doesn't have enough grunt to power all of the gear, get another UPS to run from big batteries too.

Drive it around the block a few times

I I am currently shelling out big bucks for CompTIA A+ accreditation, and one of the recurring questions that comes up centres around "Bob leaves his laptop plugged in to the AC adapter most of the time, but when he unplugs it it runs out of power quickly. What steps should you take?"

The answer is usually to clean the battery contacts and cycle the battery a few times, 'cycling' being defined as turning the sleep function off and leaving the laptop till it shuts down due to low battery.

My question is: Am I being led astray down the path of 'memory effect', or is this some sort of calibration issue I've never heard of?

N Piper

O There are two possibilities in the classic "my laptop's been plugged in for months, and now it has 20 seconds of battery life" situation.

1: The battery is genuinely dead. Perhaps it still had 40 per cent of its new capacity the last time it had to power the laptop for any length of time, but LiI batteries have a hard lifespan limit no matter how you treat them, and once they've hit that limit, they're dead. In this case, cycling the battery will do no good, but obviously also no further harm.

2: The cells in the battery have some life left, but the capacity-monitoring firmware in the battery, in the laptop, or both, has become deranged. In this case, cycling the battery may in fact help – though not because of any chemical effect.

I don't think there are any other options on this particular list, so you've nothing to lose. If a battery's really toast, cycling it a few times won't take very long anyway. A few minutes to drain it, a few more minutes for the computer to believe it's full again.

A better vision

It's a function of the times that they change. Sometimes for the better, sometimes not. But they change nonetheless.

Back in Issue 20 I wrote a five-part series called the *Uber Linux Box Project*, later turned into HTML and put in full on the Issue 36 CD. It was a tutorial series borne of building, for myself, the ultimate gateway box – a masquerading (NAT), proxy caching, firewalling, game serving, file serving, bandwidth shaping, big bad box of joy. I knew it'd be a blast to make,

wasn't actually missing it all that much. Not because its functionality wasn't handy to have anymore, but because it had somehow become less relevant.

My current system has a tasty 2TB worth of storage, so an external file server is less essential now; the firewall on the modem was perfectly adequate even if I had less control over it; and

There's certainly something awesome about managing your home network security and giving yourself extra functionality and a little speed boost to boot, all in one tidy box. But that's now icing, when six years ago it was the cake too.

And so, I decided I wouldn't rebuild. I said goodbye to my Uber Linux Box. May she rest in peace, a faithful friend that served so well and for so long. Perhaps I'll rebuild her down the road, with that fancy Layer 7 filtering the kernel now has, in some completely silent HTPC box. But right now, the times have changed, and for the better too.

Although it had already shed its shell once and changed hardware to a Shuttle box, this too eventually bit the dust.

while also being inherently useful.

And it was, for about six years. Although it had already shed its shell once and changed hardware to a Shuttle box, this too eventually bit the dust (probably literally, with no filter in the Shuttle) and died late last year. I was, at the time, too busy to find new hardware and with its Athlon X2 an extensive search revealed Socket 939 replacement motherboards were impossible to find. I put it in the too-hard basket for the moment, re-enabled the modem's firewall and disabled bridge functionality, and went on my way.

For a while, I felt naked. I missed the ad-blocker I had set up with Squid and the slight speed boost this provided, as well as the DNS cache and I could swear my optimised PPP setup was faster on the box than on the modem, as my pings weren't quite as good on the game servers. I also had to move my media-streaming to a temporary external hard drive to play files on the lounge room TV. A little bit of effort, but I told myself I'd rebuild my baby soon.

Only, a month or two later, I realised that I

ad-blocking I can get right at the browser level with programs like AdBlock Plus. And while the Squid caching was nice to have, the bandwidth it saved is no longer relevant – my broadband plan is now 80GB a month, far more than the measly limits back when the Uber Box was built. Similarly, while bandwidth shaping made it possible to keep low pings while downloading, I was too busy to play online and the faster broadband plans made this point partially moot.

And so, sadly, I came to realise I didn't need to re-build my Uber Linux Box after all. Technology had progressed far enough to make it seem mostly unnecessary.

It could still serve well as a hub, especially with NAT, for a family home or office with multiple machines connecting, but for me I didn't need it anymore. And, while I love Gentoo (which the Uber Box finally moved to) on a variety of levels, I wasn't missing my addiction to compiling the latest updates (and frequently breaking!) my Uber Box.

Ashton Mills needs no reason to like you – he just does.
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Perfecting the Polygon:

ATI and Nvidia have debated at great length about where the PC graphics industry goes next. **Tim Smalley** looks at how the graphics pipeline will change and contemplates what DirectX 11 will bring.

DirectX 10, 11 and beyond...

PC graphics is coming to a point where it needs to evolve. It's no longer enough to just produce pretty pixels because games need more than photo-realistic graphics to feel involving. Interactivity is one of the biggest problems that games developers and hardware vendors like AMD, Intel and Nvidia are going to have to solve as we move into the next generation of games. Many of these companies, and game developers, have talked at length about 'cinematic gaming', but without interactivity, the dream of a game that looks fantastic, moves freely and has the sense of drama and fun of a great movie will always be out of reach.

Using hardware to do more than create pretty pixels - accelerating physics, for instance - is clearly going to be important in the future. Before we take a look at how DirectX 11, on schedule for release at the same time as Windows 7 late in 2009 is going to change the role of the GPU, it's worth taking a look at how GPUs work currently.

DirectX-Files

DirectX 10 was a radical departure for hardware vendors and games developers because it did away with the traditional graphics pipeline – it was also a brave move for Microsoft to make as well, because the software giant threw 13 years of work away when it wiped the slate clean. DirectX 10 was built from the ground up and the three key influencers in the PC graphics industry made an incredible amount of noise about the API before its release. Microsoft claimed that there would be massive improvements in efficiency, while ATI and Nvidia described it as the best thing since sliced bread.

While that's technically the case, this extravagant praise created a problem: expectations were set so high that it wasn't surprising DX10 had a rough time in its early days. Some of this was down to poor driver support from the hardware vendors, but mostly it was because the game developers just hadn't got the hang of DX10 when Vista launched and the first supposedly DX10 games came out.

In fact, it's only recently that we've started to see games developers really use some of the new features to their advantage. Far Cry 2, for example, runs faster under DX10, particularly when anti-aliasing is enabled, and that's because when DX10 was announced, developer Ubisoft Montreal was still in the early stages of development so could easily adapt its work to take advantage of the new API's features. You could therefore say the problem for Microsoft was the fact that most of the early DX10 games were ticking boxes on a feature sheet and had DX10 shoehorned in at a late stage in the development process – they were designed to be DirectX 9 games and had no consideration for the future when work started on them.

Don't fight the future

We're not going to spend a lot of this article talking about what's been before though, as DX10 has been explained and discussed many times; but, as a brief reminder, we will go through the major changes and their implications because they've established the direction in which the graphics industry will move in the future.

First of all, Microsoft decided that in order to pave the way for the future, it needed to lay some solid foundations with a new display driver model, Windows Display Driver Model (WDDM). This was only available with Windows Vista and is probably cause for a lot of the criticism aimed at DirectX 10 – that Microsoft had turned its back on the Windows XP faithful.

According to Microsoft, WDDM achieved "unprecedented stability and performance" by splitting the driver into two key components, the User Mode Driver (UMD) and Kernel Mode Driver (KMD). Microsoft told hardware vendors to move as much of the display driver as possible into the UMD area, so that only the essential parts were sitting in a secure part of the operating system's kernel. This was to increase the stability of Vista, because a crash in the UMD area won't cause the whole OS to crash. Other improvements that came with WDDM included GPU threading, which allows a GPU to share its resources across multiple processes – something that wasn't possible in Windows XP.

In addition to changing the driver model, Microsoft had spotted other problems that needed solutions – these included the overhead of DX9, variable hardware capabilities and the limitations associated with fixed function hardware associated with previous versions of DirectX.

Problem solvers

DirectX 10 attempted to resolve these issues with a number of significant changes. The biggest was, of course, the move to a unified programming model – there were no longer separate Vertex and Pixel Shaders; they were now one and the same and as a result, when it came to hardware design, ATI and Nvidia created GPUs that had only Stream Processors.

DX10 also introduced a third type of shader available to programmers, in addition to the Pixel and Vertex shader. Unlike the Vertex Shader, the Geometry Shader is able to process entire primitives – triangles, lines and vertices from the Vertex Shader – as inputs and generate or modify existing primitives, outputting them without the need for CPU intervention. This is a technique known as data amplification, but it was unfortunately understated in the first-generation DirectX 10 hardware – particularly in Nvidia's G80 (GeForce 8800-series) architecture – which meant that developers had a difficult time using the feature effectively. It's hard to predict developer usage models for new additions like the Geometry Shader; this is especially true when you realise that G80, Nvidia's first DX10 architecture, started its long development before the GeForce FX 5800 launched early in 2003. Still, both ATI and Nvidia have made significant improvements in this department with their current generation architectures – both hardware vendors have explained that this was down to feedback from the developer community.

DX10 also introduced the Stream Output buffer after both the Vertex and Geometry stages of the pipeline. It's essentially a mid-pipeline memory write capability, which means that instructions which don't need Pixel Shader ops can be written straight to local frame buffer memory. Stream Output can be used to great effect in conjunction with the Geometry Shader, because it gives the GPU the ability to not only generate data, but to destroy it and stream it as well – this means that complex particle systems could be introduced, for instance. One example is the 'soft' particle effect introduced in many DirectX 10 games like BioShock and World in Conflict.

On top of this, the Stream Output enables the GPU to redraw geometry generated in the Vertex and Geometry Shaders without intervention from the CPU – the first, but not the only evidence of Microsoft's desire to reduce

Bioshock in DirectX 9.

Bioshock DirectX 10.

API overheads. Texture arrays, predicated draw and improved resource validation also help to reduce the API's reliance on the CPU, although DX10 still used a single-threaded renderer.

The point of one

DirectX 10.1 was an incremental update to the original release and it completed the DirectX 10 specification – Microsoft often refers to it as 'Complete D3D10'. Despite this, we've been assured by ATI, Microsoft, Nvidia and a number of games developers that DX10.1 will never become a minimum specification – it's merely a set of extensions to DX10. If the games industry tossed all of the DX10 hardware aside – and there have been tens of millions of DirectX 10.0 GPUs sold – it would be shooting itself in the foot. Games publishers really only care about installed bases and are pretty cold hearted when it comes to making money. New technology has to make sense to them from a business perspective first and foremost.

Although DX10 was a big step forwards, DX10.1 aimed to take the API even further down this path, thus making GPU behaviour more predictable for developers trying to implement new effects and features. Its new features include new texture formats, higher precision and more stringent multi-sampled anti-aliasing requirements.

Microsoft also improved access to multiple render targets (MRTs) by allowing the Pixel Shader to simultaneously output to more than one render target at a time while each buffer (or MRT) can apply its own blending operation. Taken as a pair, these two improvements enable support for significantly more efficient multi-sample anti-aliasing in game engines which use deferred rendering (such as Unreal Engine 3). This is because deferred rendering stores multiple lighting passes on game surfaces in the buffers, and with DX10.1 you can now read from these buffers while performing a blend operation at the same time – and the process can be done in a single pass.

Currently, only ATI's Radeon HD 3000- and 4000-series graphics cards support DX10.1. Nvidia decided to focus its efforts on other areas, such as GPU Computing and PhysX, although everything it has released since G80 supports at least a few DX10.1 features, even if Nvidia is pretty cagey about which ones do specifically.

During conversations with Nvidia's Tony Tamasi, Senior Vice President of Content and Technology, and John Montrym, Chief Architect for GT200 (the architecture the GeForce GTX 260 and 280 is based on), we were told that Nvidia didn't want to talk about which DirectX 10.1 features it didn't support. However, Tamasi did tell us that Nvidia's hardware does support reading from the multi-sample depth buffer with deferred rendering engines. This is important, because it happens to be the one DirectX 10.1 feature that game developers have really talked to us about at great length. It's also the only major feature we've really seen rolled out

DIRECT X 10 — Sub-D modelling, Animation, Displacement Map, Generate multiple LODs, Polygon mesh. Creating models with the current content authoring pipeline takes a lot of work, as various models need to be created for the different levels of detail. That is required to scale across different hardware.
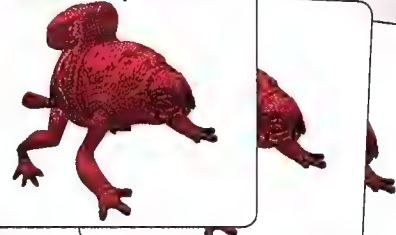
DIRECT X 11 — Sub-D modelling, Animation, Displacement Map, GPU, Optimally tesselated mesh. A simple Sub-D model is tesselated and then displacement mapped using the three new stages in the DirectX 11 pipeline to achieve an optimally tesselated mesh that scales depending on the GPU's capabilities.

Tessellation is an effective way of using hardware to scale a model's detail level

Turning it up to 11

At some point during 2009, Microsoft is planning to introduce the next major version of its OS, Windows 7, and with it will come DirectX 11. DX11 will also be available for Vista as well, and it's expected to ship with Vista Service Pack 2, but that may change if one or other is delayed.

Microsoft has said from the outset that DX11 will be an expansion of DX10.1, and in addition to adding new functions and features there's also been a big focus on improving scalability and efficiency. It's important to be careful with word choice here, because Microsoft made some promises of big speed increases with DX10, when all it really did was enable hardware to be more efficient when it was processing more concurrent or complex instructions. For the most part, performance didn't (or hasn't yet) improved with DX10, especially when you're talking about techniques that were already being used in DX9. DX10 did however enable developers to use techniques that weren't possible with previous versions of the API because they were too slow.

We're not expecting raw frame rate jumps with DX11 but the conversations we've had with developers on the DirectX advisory board suggest that developers should be able to do more with the new API because it will be more scalable and efficient than what's currently available. One area where this is particularly the case is content authoring, as the new API will enable developers to create more complex and realistic characters, while not sacrificing scalability and efficiency. The current trend has been for developers to build characters with increasingly complex meshes of triangles, and then reducing the number of triangles depending on the horsepower available in a particular system. To help, Microsoft is introducing three new stages in the DX11 graphics pipeline: the Tessellator, the Hull shader, and Domain shader, although the inclusion of the latter two is basically to facilitate the inclusion of the Tessellator.

In addition to these three new stages, changes have also been made to the Pixel shader stage in the pipeline, which enables the addition of the Compute Shader, which in turn allows developers to use the GPU for more general purpose computing tasks. It was evident from our discussions with various game and general-purpose application developers that there's an almost unlimited number of ways in which the Compute shader can be used. As long as there is a way to massively thread an application, there's a use for the Compute Shader.

Of Tessellation, Hull and Domains

Tessellation has been around ever since the launch of Microsoft's Xbox 360 in late 2005 as its ATI-designed Xenos GPU includes a dedicated hardware tessellation unit. Tessellation enables developers and artists to create more realistic and complex characters without huge graphics memory overheads.

When an object is further away from you, it's harder to see, and to reflect this in a game, it needs less detail and therefore, fewer triangles are needed to draw it. As the object comes closer to the viewer and fills the screen the number of triangles for that particular object needs to increase to up the detail and make it look more realistic. Traditionally, developers approach this issue by creating a character using a basic subdivision model (a representation of the shape using a coarse polygon mesh, called Sub-D), then moving to a more sophisticated animated and displacement-mapped model which has a polygon mesh applied to it. Once the mesh has been applied, it is then scaled back to various levels of detail (LODs) before it's even sent to the GPU. The various LODs can either be used for different classes of hardware, or they can be used when characters, or objects for that matter, are further away from the player – adding more detail to a scene with the smallest performance hit that is possible.

Instead of generating and storing all these discrete LODs, tessellation allows DX11 to use the GPU to work out how to increase the detail of Sub-D model. Take, for example, the problem of pointy heads. As game characters are drawn from triangles, if they're bald, they can frequently end up with pointy heads, because the curve of the skull has to be made from triangles. Previously, the only way to get a smooth curve has been to use lots and lots of triangles in the model – which obviously makes the model very hard work to process. In DX11, the tessellator (in conjunction with the Hull and Domain shader) will be able to take a relatively simple Sub-D model and work out how to smooth the path between two points using tessellation. It does this by looking at the model and subdividing the existing triangles, so blocky, angular surfaces can be made smoother and more realistic. Not only does this make it quicker for game developers to create content, as the tessellation is all done inside the graphics pipeline, you're not having to move around or work on massively detailed, memory hogging models as much as before.

It's important to note that the tessellation stage of the pipeline doesn't work with triangles; instead, it works with patches, representing curves or regions of a model's surface, and of course, specific points on the model. The Hull Shader is where the process of tessellating an object is set up; it takes control points for a patch and then calculates the level of tessellation required between these two points. The control points are then forwarded onto the Domain Shader – the tessellator isn't aware of the control points.

Instead, the tessellator is fed a number of 'TessFactors' that tell it the level of tessellation

Tessellation enables developers and artists to create more realistic and complex characters...

required on a particular patch. The Hull Shader also tells the tessellator what mode it should operate in – the developer will be able to specify the way that the tessellation process is completed because, although the tessellation unit is fixed-function, it has a variety of operating modes. The tessellator then takes what it's fed by the Hull Shader and works in patches to create the additional geometry required. Once this is complete, it outputs the domain points and topology data.

There's clearly big benefits to tessellation, which is why AMD introduced tessellator hardware in its Radeon HD 2900XT, and has included it in every subsequent GPU it has released. It hasn't really been used so far, and sadly both Microsoft and AMD has confirmed that the Xbox 360's (and by extension the Radeon HD 2000, 3000 and 4000-series) tessellator isn't compatible with DX11. Microsoft claims its design for tessellation is more robust and more flexible than what AMD had in mind. Still, AMD's

RAY OF LIGHT

Ray tracing is one of those buzz words that has been going around the graphics industry for a long time, but even with DirectX 11 we're still a long way from the 'holy grail' that is real-time ray traced 3D graphics.

Ray-tracing involves lighting a 3D scene by tracing the path of individual rays of light and as such, it's able to introduce a very high level of photorealism – but that comes at a cost, as it's incredibly hardware intensive. As a result, it's a technique that's usually used only in Hollywood movies, because you can't afford to spend days waiting for the next frame of a 3D scene to arrive in a game. Even some movie studios aren't prepared to accept the time it requires – Pixar's 'Cars' is one of the few Hollywood films to extensively use ray tracing in favour of a blend of ray-tracing and more conventional rasterisation techniques.

Ray-tracing works by tracing a path from an imaginary eye through each pixel on a virtual screen – the algorithm then calculates the colour of the object that is visible to the eye. Each ray has to be tested for intersection with objects in the scene and when intersecting objects are found, the algorithm estimates the amount of incoming light at intersection while examining the material properties – it then combines these two to calculate the final colour value of the pixel.

In order to boost efficiency by many orders of magnitude, rays are cast from the perspective of the viewer (i.e. from the camera) and not cast or reflected from light sources and objects into the viewer's eye as in real life. The reason for adopting this method is that there are many light rays which never make it directly into the imaginary eye and calculating light paths that don't directly impact the viewer is a complete waste of resources.

Currently, the power required for real-time ray-tracing is several orders of magnitude larger than the amount conventional rendering techniques such as rasterisation require, and it returns only a proportionally small gain in image quality. There's no doubting that ray tracing is the most accurate way to create a realistic 3D environment, but the question is whether it is an efficient use of transistors?

In the last few years, we've talked about ray tracing with many key industry visionaries and it's been Intel which has made the biggest push towards fully ray traced 3D environments in games. Even as recently as 2007, Intel appeared to believe that the future of gaming graphics was fully ray traced 3D environments, while every other industry insider believed otherwise. Thankfully, Intel has toned its views down a little since.

During a discussion with Andrew Chien, Director of Research at Intel, he admitted that "ray tracing presents many challenges from a performance perspective," but he believes that Intel can overcome this to deliver products

Raytracing can produce spectacular results, but its extremely computationally intensive.
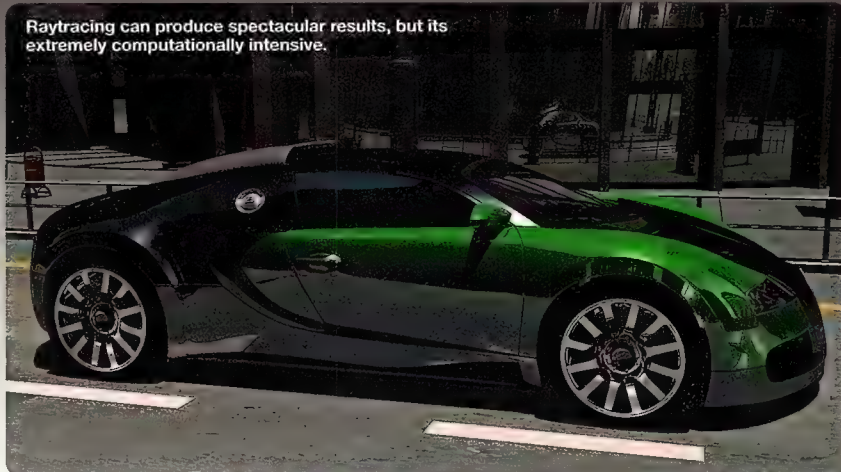
that help to make ray tracing a desirable tool for developers. The ray-tracing demos which Intel has shown – such as Daniel Pohl's work ray-tracing Doom 3 and Quake 4 – have been hugely impressive, and there's no denying that the lighting effects and shadowing are second to none. However, in addition to the enormous amount of power required, visually there are issues, and aside from the lighting, everything else in the environment pales in comparison to what is currently achievable with rasterisation.

Both AMD and Nvidia, like Chien, believe that ray tracing is simply another tool in the developer's toolbox – and a great one at that – but no-one believes the industry is ready to move to fully ray traced 3D graphics engines. Of course, you could argue that the two traditional graphics powerhouses have spent such a lot time and money developing hardware focussed largely on rasterisation, and as such have a vested interest. This is too cynical a view, though: both AMD and Nvidia have spent a lot of time researching ray tracing.

In the last year, Nvidia has acquired not one, but two companies that specialise in ray-traced graphics. The first is mental images, an industry leader in ray tracing technology known for its 'mental ray' ray-tracing software. The most extensive example of it in use is in Pixar's Cars. Nvidia followed this acquisition by snapping up RayScale, a small but talented start-up that was spun out from the University of Utah and which has helped Nvidia develop several hybrid ray tracing and rasterisation proof of concepts.

During a discussion with Nvidia's Chief Scientist David Kirk, he stated his belief that rasterisation "will definitely be around in ten years time, so will scanline rendering and so will

ray-tracing for certain kinds of visual effects."

"People use ray-tracing for real effects as well though," he continued. "Things like shiny chains and for ambient occlusion (global illumination), which is an offline rendering process that is many thousands of times too slow for real-time. Using ray-tracing to calculate the light going from every surface to every other surface is a process that takes hundreds of hours."

AMD's Worldwide Head of Developer Relations, Richard Huddy, said a similar thing – during an interview, he asked me to look around the room we were sitting in and point out objects that would be hard to model with traditional rasterisation techniques. "There are very few scenarios where ray tracing makes complete sense because of the performance implications. But in situations where there is a true benefit to image quality – on shiny or reflective curved objects for example – I see ray tracing being used in the future.'

Intel's Chien expects ray tracing "to first penetrate areas where the additional flexibility is of benefit to developers." He went on to point out that "if the image quality benefits are there but performance isn't acceptable, developers aren't going to use it."

It's well known that Intel is planning to enter the graphics card market with Larrabee at some point in 2009. Larrabee will be based on a series of simplified X86-derived processing cores, but while some early speculation stated it would be a ray-tracing only chip, its main focus is actually rasterisation and not ray-tracing, according to Intel software engineer Tom Forsyth. The industry does appear to be lining up to use ray-tracing for certain graphical effects, but rasterisation is here to stay.

persistence has made the industry as a whole more aware of the potential benefits offered by hardware-based tessellation. On a more practical and less altruistic level, the Radeon HD 4000-series tessellator did go through a few changes, and developers can now access it in DX10 applications. This gives developers and artists a stepping stone to DX11, enabling them to experiment with tessellation today in an environment that's fairly similar to DX11.

Does not compute

Aside from tessellation, the other major addition to DirectX with version 11 is the Compute Shader. It addresses GPGPU work, so it isn't something that's especially new. Instead, it's more a formalisation of what AMD and Nvidia have been talking about for a few years now, with Stream and CUDA respectively. Nvidia in particular has been pushing its CUDA platform heavily since the launch of the GeForce 8800 GTX in November 2006, but the current lack of support on non-Nvidia hardware may plague CUDA's acceptance in the wider market. That is, unless things progress into the realm of complete programmability.

What is clear with CUDA, however, is that Nvidia's architects managed to transform the GPU from a piece of silicon that did nothing but solve graphics problems into a chip that can effectively accelerate massively parallel general-purpose applications. AMD has been working on the same with its Stream Computing initiative and we've seen video encoders from both companies.

Microsoft's reasoning for including a Compute Shader in DX11 is more focused on gaming than on GPGPU computing. However, after speaking to several industry luminaries, we think the Compute Shader will likely be used for more than just solving problems games developers face. Much of what the Compute Shader does isn't new for the computing industry, but it is new to DirectX and for GPU programming. Techniques such as being able to write general-purpose code without having to use triangles, sharing data between threads and handling scattered write operations are all possible with both AMD's Stream SDK and Nvidia's CUDA compiler, but neither have the all-important hardware agnostic compatibility at the moment. Microsoft will enable this for all DX11 graphics cards.

As a result of taking this into account, the graphics pipeline will be able to generate data structures traditionally associated with general purpose computing tasks handled by the CPU. Using the Compute Shader, these tasks will be able to scale across any number of stream processors as long as there is scope for the application to be as parallel as the hardware allows. According to Microsoft, the main target applications for the Compute Shader include post processing, physics, AI and more advanced techniques, like ray-tracing.

When it comes to game physics, developers are currently divided between the three options available – PhysX, Havok or creating their

own physics engine. None of these are ideal because all three involve compromise. PhysX is only accelerated by Nvidia CUDA-enabled GPUs, but will run on the CPU if a GeForce 8 (or higher) isn't present. Havok only runs on the CPU at the moment, but AMD has made promises to accelerate this on ATI Radeon graphics cards. Such coding requires a lot of time and effort (not to mention money) and the likely choice is to only run physics effects on the CPU. Without an industry standard API, it's impossible for developers to accelerate physics on all GPUs because their similarities end at API compatibility – where DirectX 11's Compute Shader comes to the rescue.

A multi-threaded API

While multi-core CPUs are mainstream today, DirectX still isn't multi-threaded which, when you think about it, is quite surprising. Both AMD and Nvidia have worked on multi-threaded drivers, but the success has been limited because the API is ultimately single threaded. We've spoken to a number of developers over the years about multi-threading – some have come up with ways to utilise the increased core count, while others have struggled to extract more performance and have often left those additional cores sitting idle. That's becoming less and less of a problem nowadays as developers have started to think about threading, but there are still scenarios where games are incredibly CPU limited.

This should change with DX11 and Microsoft will make these benefits available to DirectX 10 class hardware as well. AMD's and Nvidia's respective driver teams will need to do some work to implement this into their drivers, but since they'll already be doing the work for DX11 hardware, it doesn't seem like much of a stretch to add support for DX10 GPUs as well.

The way Microsoft will support multi-threaded action in DirectX is by splitting a Direct3D device down into three separate interfaces: Device, Immediate Context and Deferred Context. Each one is assigned to a thread and with both Device and Deferred Context interfaces, there can be more than one thread assigned to queue up tasks for the Immediate Context or Render thread.

Switching between threads is said to be fine grained, so developers should be able to manually decide how and in what order operations are queued up for the Immediate Context interface. Each Device interface can load thread resources as and when it needs to, while the Deferred Context interface acts as a per-thread device context for future rendering operations – it queues up draw calls (or Display Lists) before passing them onto the Immediate Context interface when it's ready for them.

For DX10 hardware, Deferred Context interfaces will need to be implemented in software instead of hardware as there are some new hardware-based optimisations for multi-threading. Because of this, Deferred Context interfaces will not be free-threaded on DX10

hardware and a dedicated thread will have to be allocated to Deferred Contexts at the API level.

Bonus Features

There are a number of other features being introduced with DirectX 11, but they aren't as significant for gamers. There are additions including a couple of new texture formats and improvements and some optimisations for the Geometry Shader and Stream Output sections of the pipeline.

The most important of these enhancements is Dynamic Shader Linkage, designed to address problems with the flexibility of shader instructions and their scalability as they continue to get more and more complex. For example, if a developer needs to use multiple shaders in a certain scenario, a large 'über' shader is often chosen because it combines all of the shaders that might be needed in that particular scenario into one rather large instruction. The downside with this approach is that it results in incredibly complex shaders that are not only more inefficient than individual shaders, but that are also very difficult to debug.

Microsoft believes the answer to this problem is subroutines, which enables developers to link shaders together, meaning simpler, more specialised shaders can be created for the different classes of hardware being targeted – it will also reduce the amount of register usage compared that single über shader.

Hopefully, this should mean developers can be a little more ambitious when they're writing shaders but it's unlikely to have any noticeable impact on gamers.

APPLICATION

User Mode Driver ⟷ Direct3d

User Mode
Kernel Mode

DXGKrnl
GPU Scheduler | Video Memory Manager

Kernel Mode Driver

Graphics Hardware

Microsoft split the new driver model into two modes and encouraged hardware vendors to move as much of their drivers into the User Mode Driver to allow driver recovery
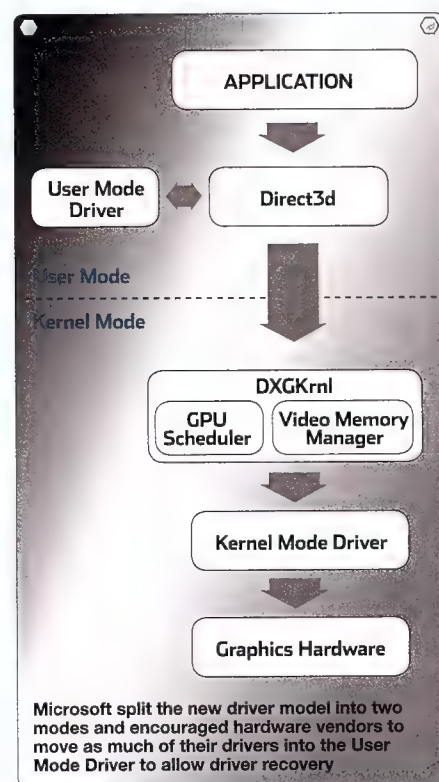
HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

We're always looking for more ways to get across whether a given piece of kit is worth your time or not, and this issue we've started using another indicator. We love a bit of overclocking, but not just on CPUs – from now on, every graphics card we review will be stamped with an OC rating.

This figure – a percentage score – represents how far we've been able to push a given card above its out-of-the-box settings, while still keeping performance stable. Higher numbers are of course better, so if you're an inveterate tweaker like us, this will be invaluable in showing the best of the overclocking breed.

Powered by

msi ™

41

36

44

ASUS M4A79T Deluxe

An expensive board, but do you get your money's worth?

Street Price $365 **Supplier** ASUS
Website www.asus.com.au
Specifications Socket AM3; AMD 790FX chipset; ATX form factor; 4x PCIe x16; 2x PCI; 1x EIDE; 5x SATA; DDR3-1333
Gallery Link www.atomicmpc.com.au/?138657

While it isn't every day we get a new piece of tech, it still happens pretty darn often around here, and the most interesting ones will get photographed before we've even benched them – just bash that URL in above to see what we do. This board from ASUS qualified pretty well, being its version of an AM3 enthusiast mobo. It looks cool, but does it meet the mark of the relatively high price tag?

Based around the ubiquitous 790FX chipset, this board has four PCIe 16x slots that will run at 8x electrical when three or more cards are used. It's also got two PCI slots for soundcards or TV tuners, though any of the 16x slots can work as a 1x/4x slot if you run out of room. All this tech is plugged into a dark brown PCB that makes it look like a giant (albeit very flat) chocolate bar, with strong colours used that should look quite nice in a windowed case.

The chipset cooling array looks particularly impressive, a warm copper arrangement consisting of a tall heatsink for the power regulation, a wide heatsink with an 'X' shape on it for the Northbridge, and a shorter square for the Southbridge. They're all connected with heatpipes to promote better heat transfer, but that still didn't prevent the board from getting a little warm without airflow.

There's ten ferrite chokes lined up next to matching solid caps just west of the CPU socket, and only solid caps are used all over the board. The AM3 socket also has enough clearance for standard-height memory in the two closer orange slots when using an aftermarket heatsink. All four DDR3 slots support dual-channel, simply by matching identical sticks in identical colours.

Power connections are good for the board too, as the 8- and 24-pin connectors are placed well (the 8-pin is especially accessible). Storage is no slouch, with a right-angled IDE socket and five SATA ports – though only two of these are right-angled. For such an expensive board, we'd have liked to see at least six right-angled ports here.

Power and reset buttons are included next to the front panel headers, and are right next to the USB headers. A floppy socket and audio header round out the important connections along the bottom.

The I/O panel at the back of the mobo is a decent enough offering, with two PS/2, six USB, Firewire, eSATA, Optical/Coaxial, Ethernet and 7.1 channel audio (provided by a Realtek ALC1200 sound chip). Also onboard are some flash chips with ASUS' ExpressGate onboard, though this OS is limited in its usefulness.

Getting into the meat and potatoes of the board, we gave it our Phenom II X810 chip and pushed it until it wouldn't boot, then pushed it a little more. We hit a max HT speed of 280MHz (giving a result of 4247 in Cinebench 1x), but we were strangely limited in the voltage stakes by the BIOS – 1.45V was the maximum Vcore we could use. We're half convinced that this measure is to protect the CPU from people who aren't really sure what they're doing, but even turning on the 'Extreme Overvoltage' setting for the CPU wouldn't let us increase it more.

The highest clock we've hit on an AM3 board is 289, so it's not too far off. **JR**

AM3 Me!

The AM3 socket might seem new, but in reality it is the old AM2+ socket with two pins removed – bringing it to only 938. It's got a faster HyperTransport bus speed, but is only compatible with AM3 CPUs. AM2+ can handle both AM2+ and AM3 CPUs with a BIOS update, so we'd only suggest AM3 for a new AMD system.

ASUS M4A79T Deluxe

	X4 810	200x13; DDR3-1333 7-7-7-21	217x13; DDR3-1446 7-7-7-21	230x13; DDR3-1532 7-7-7-21
PiFast		41.45s	37.99s	35.77s
wPrime 32M – single thread		57.173s	52.763s	49.122s
wPrime 32M – multi-thread		15.038s (3.80x efficiency)	14.272s (3.70x)	12.949s (3.79x)
CineBench R10 64-bit – single thread		2979	3234	3479
CineBench R10 64-bit – multi-thread		11008 (3.70x efficiency)	11904 (3.68x)	12437 (3.58x)
Everest Read		8666MB/s	9448MB/s	9982MB/s
Everest Write		6624MB/s	7321MB/s	7759MB/s
Everest Latency		52.5ns	48.4ns	45.6ns
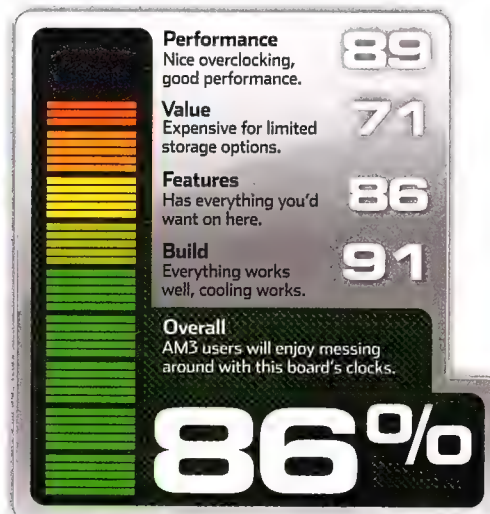
Performance Nice overclocking, good performance. **89**

Value Expensive for limited storage options. **71**

Features Has everything you'd want on here. **86**

Build Everything works well, cooling works. **91**

Overall AM3 users will enjoy messing around with this board's clocks.

86%

EVGA X58 SLI

The first non-NVIDIA chipset mobo from EVGA.

Street Price $529   **Supplier** EVGA
Website www.evga.com
Specifications Socket LGA1366; Intel X58 chipset; ATX form factor; 3x PCIe x16; 2x PCI; 1x PCIe x1; 1x EIDE; 9x SATA; DDR3-2133
Gallery Link www.atomicmpc.com.au/?136665
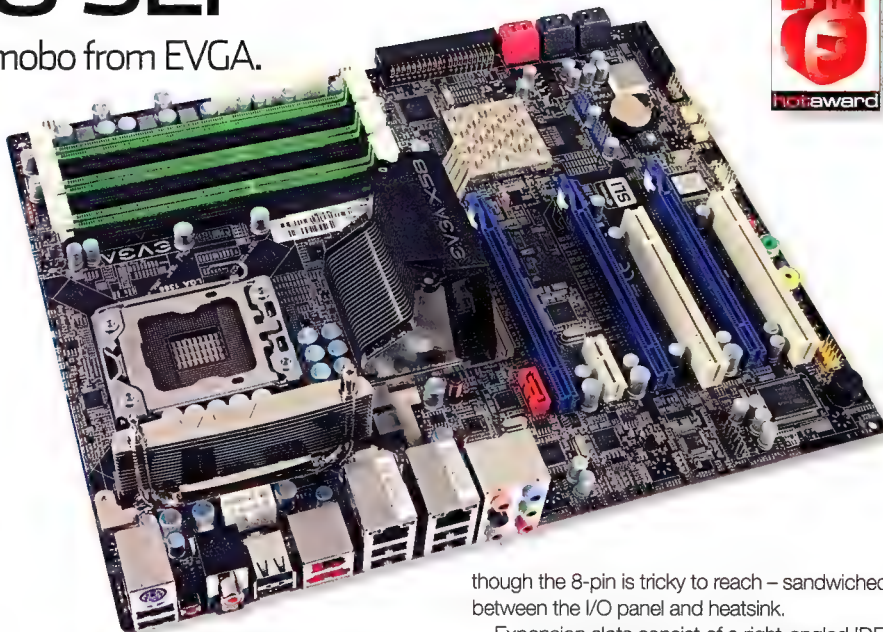
The realm of Intel chipset-based motherboards has been something that EVGA has stayed away from for quite some time, mostly due to the fact that they are solely NVIDIA-based – they had no real motivation to make any other kind of board. Since Intel made the agreement with NVIDIA for SLI on their X58 chipset, they've got a great excuse to make their own version of the mobo – and we're all for it.

We figure the more X58 boards floating around out there the better, since competition will be high and prices will (hopefully) be brought down fast enough so that veryone can afford a reasonably good mobo for their Nehalem chip.

Running the X58 chipset gives this mobo plenty of bandwidth for the expansion slots, giving two full PCIe 16X 2.0 slots, leaving the third slot to be taken care of by the NVIDIA NT200 chipset. This also enables SLI support; up to three graphics cards can be whacked into the board without being restricted by bus speed.

Supporting Nehalem also means supporting both the LGA1366 socket, and the QPI. The

X58 – Get it straight

The X58 chipset, codenamed Tylersburg, is a 65nm chip that has a total of 40 PCIe 2.0 lanes, and generates 24.1W of heat under use. It's called an *I/O Hub* instead of a *Memory Controller Hub* like previous chipsets, as the memory controller was moved to the Core i7 CPU. Check out our site for more info at **www.atomicmpc.com.au/?127372.**

QPI replaces the FSB in traditional Intel boards, and is instead a bi-directional version of AMD's HyperTransport, offering increased bandwidth back and forth at the same time, independent of all the components.

Physically the board is very swish, with a black PCB and brightly coloured slots adorning it. There's a decent amount of clearance around the CPU socket too, so you can fit large coolers without too much worry. The voltage regulation gets its own heatsink that is like a mini-tower, consisting of a single heatpipe bent into a U shape and some fins. The northbridge is a shortish heatsink with a fan attached just underneath that plastic shroud (this was quite loud during testing thanks to the very small fan blades). This links to the southbridge via a very flat heatpipe, and the whole cooling array works quite well, though the voltage regulation got quite warm.

The six DDR3 slots are colour-coded to show the correct guide for memory channel use, with the green slot closest to the socket being used first. 24-pin power connection is in a good place, though the 8-pin is tricky to reach – sandwiched between the I/O panel and heatsink.

Expansion slots consist of a right-angled IDE port and six right-angled SATA ports, with a further two normal ports along the bottom edge of the board. There's also a handy LED POST screen here, which doesn't show anything of use once the board has booted. Clear CMOS, power and reset buttons are here, while the latter two also have status LEDs to show power and HDD activity respectively.

There's an onboard speaker in the bottom-left corner, and the expansion slots have plenty of room for triSLI or Crossfire. I/O options are rather good as well, with eight USB, PS/2, Optical/Coaxial, Firewire, eSATA, two Ethernet, 7.1 audio and another more accessible clear CMOS button.

Overclocking of the board was quite nice, and we managed to eke out a max QPI speed of 164, a very solid result. Coupled with a great bundle, a decent price and EVGA's typically helpful support this is a perfect choice for any enthusiast rig. **JR**

EVGA X58 SLI

	i965	133x24; DDR3-1600 8-8-8-24; 3.2GHz	150x24; DDR3 1500 8-8-8-24; 3.6GHz	160x24; DDR3-1604 8-8-8-24; 3.84GHz
PiFast		26.58s	23.64s	22.56s
wPrime 32M – single thread		35.688s	31.639s	30.702s
wPrime 32M – multi-thread		7.361s (4.85x efficiency)	6.581s (4.81x)	6.399s (4.80x)
CineBench R10 64-bit – single thread		4656	4907	5425
CineBench R10 64-bit – multi-thread		18883 (4.06x efficiency)	21460 (4.37x)	21901
Everest Read		18119MB/s	15177MB/s	18306MB/s
Everest Write		13931MB/s	12846MB/s	14224MB/s
Everest Latency		31.7ns	32.9ns	31.5ns

Performance Very nice performance, good overclocker. **94**

Value Pricey, but worth it. **88**

Features Some good ideas here. **90**

Build Gets a little warm in places, but reliable. **92**

Overall As far as X58 mobos go, this is up there with the big dogs.

91%
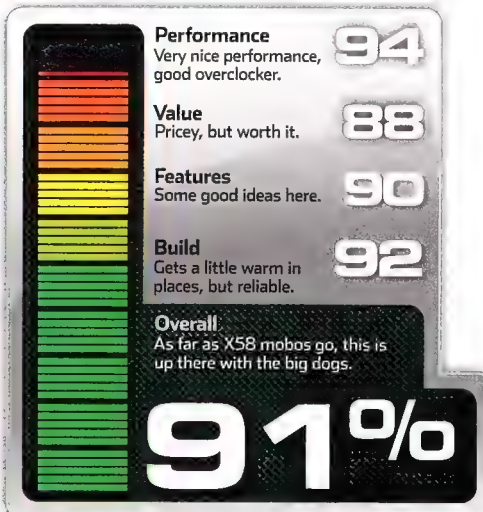
MSI 790FX-GD70

We beat this board black and blue, benching it just for you.

Street Price RRP$339 **Supplier** MSI
Website http://www.msi.com.tw/

Specifications Socket AM3; AMD 790FX chipset; ATX
form factor; 4x PCIe x16; 2x PCI; 1x PCIe x1; 1x EIDE; 8x
SATA; DDR3-1333
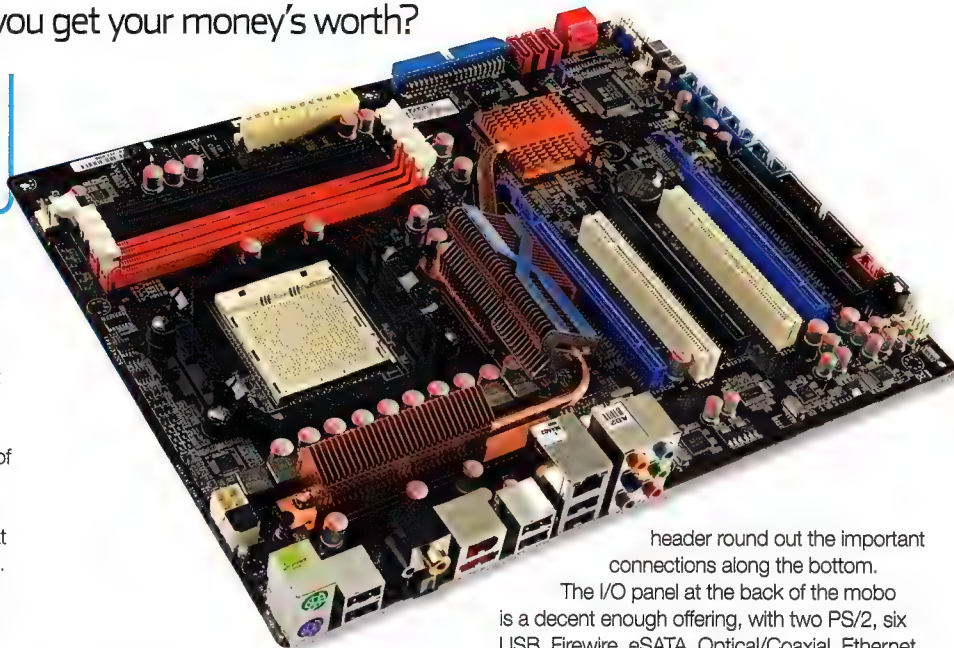
Gallery Link www.atomicmpc.com.au/?138739

We've had a look at a swathe of boards from MSI before, each of them with their own endearing quirks. From loopy Zalman heatsinks, to boards with built in waterblocks, we've seen a lot – but this has two funny features that are actually very cool (with no pun intended).

The board is based around the 790FX chipset, which is a 65nm offering that also includes 42 PCIe lanes. This means that the chipset can power quite a few PCIe 16X slots, as well as lots of onboard devices. Check out the 'Special FX' boxout for a little more on the chipset, but the most notable feature about it on this board is its location. Usually you can find the Northbridge just below the CPU socket, but here MSI has moved it to line up directly with the power regulation, and they both sit underneath one giant heatsink.

This is actually a decent design choice, as a single heatsink in the path of airflow from the CPU heatsink will give better heat dissipation, not to mention how cool the gunmetal grey looks. It's connected via a nickel-plated heatpipe to the Southbridge, a smaller affair that becomes

Special FX

The 790FX chipset is codenamed RD790, and also called 'Wahoo' behind AMD doors. It consumes a measly 8W of power, and usually has a tiny 16KB cache for improved latencies. Crossfire is also available, though SLI is NVIDIA/X58 turf. Made with a pinch of love in every one (that one might be made up).
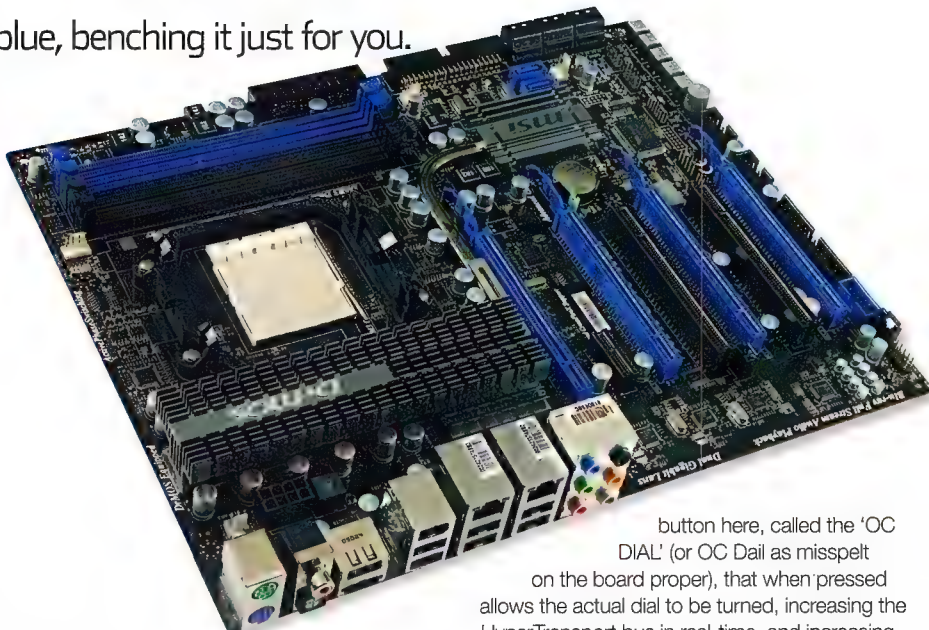
very warm under load with no airflow – in a good case, however, this won't be a problem.

There are a row of solid caps and ferrite chokes just between the giant heatsink and the AM3 socket, but we found that there was limited space for our memory when using aftermarket coolers – only the two blue slots (one pair for a single dual channel link) could be used thanks to our TRUE's overhanging heatpipes. The usual 8- and 24-pin power connectors are also around in the most common places.

Storage options are pretty well fleshed out, and MSI has chucked six right-angled SATA ports on (as well as an extra two vertical ones), and a right-angled IDE port. For those floppy lovers, there's a port there just for you too. This board has a huge amount of buttons and a single dial – the second feature we mentioned.

There are power, reset and clear CMOS, but the Green Power button activates power saving tech (not that it's recommended for overclocking, and might cause instabilities). There's a final

button here, called the 'OC DIAL' (or OC Dail as misspelt on the board proper), that when pressed allows the actual dial to be turned, increasing the HyperTransport bus in real-time, and increasing the CPU clock. This proved to be quite handy in practice, and squeezed out an extra 6MHz on top of our max OC in the BIOS. The HT bus modified with the dial isn't saved to the BIOS however, and the board won't boot with it at the artificially increased speed.

Expansion slots give four PCIe 2.0 16X slots that run at 8X electrical when three or more are used, two PCI slots and a single 1X PCIe. A POST screen is also included, though once it's booted shows nothing more than 'AA' – we'd love it if it could show the CPU temp, or something useful.

Overclocking through the BIOS got us to a disappointing 261 HT bus, with a max of 267 reached in Windows when using the Dial. No amount of airflow seemed to help either, so we hope a BIOS update in the future will improve this. **JR**

MSI 790FX-GD70

X4 810	200x13; DDR3-1333 7-7-7-21	217x13; DDR3-1446 7-7-7-21	230x13; DDR3-1532 7-7-7-21
PiFast	41.37s	38.17s	35.91s
wPrime 32M – single thread	58.188s	53.692s	49.795s
wPrime 32M – multi-thread	15.506s (3.75x efficiency)	14.475s (3.71x)	13.043s (3.82x)
CineBench R10 64-bit – single thread	3043	3289	3480
CineBench R10 64-bit – multi-thread	10948 (3.60x efficiency)	11798 (3.62x)	12789 (3.67x)
Everest Read	8733MB/s	9350MB/s	9779MB/s
Everest Write	6594MB/s	7278MB/s	7585MB/s
Everest Latency	51.6ns	48.8ns	46.2ns

Performance 79
Good at stock levels, won't OC amazingly.

Value 70
Expect cheaper at street, still expensive.

Features 86
OC Dial is nifty!

Build 85
Chipset shuffle is our favourite dance..

Overall
Solid and dependable, but don't expect world records.

81%

Zotac GTX285 AMP Edition

Here, there be dragons.

Street Price $698   **Supplier** Zotac
Website www.zotac.com.au

Specifications 702MHz core; 1296MHz memory (2592MHz effective); 1512MHz shader; GT200 core @ 55nm; 240 stream processors; 1GB GDDR3; 512-bit memory interface; dual slot PCB with active cooling; two 6-pin PCIe power connectors

Card info www.techpowerup.com/gpuz/4scb8/

Just like the maps of old, back when the world was assumed to be flat and the direct centre of the entire universe, this card has a dragon on it. Not just any dragon, but a fire-breathing monster with a honeycombed background – a cute visual metaphor for the impressive overclock on this beastie.

It's called the AMP edition for a reason, as Zotac grabbed the GTX285 reference design and bumped the clocks up a notch. They've added 54MHz on the core, 54MHz on the memory and 36MHz to the shaders. This should prove to be a significant increase in benchies, but we'll get to that in a minute.

Physically the card is the same as the reference model, with a large plastic shell covering the cooling inside. It's got a large squirrel-cage fan that sucks in air and idles at 57.6dBA, with a load noise of 70.6 to keep it cool. Temps are a nice 46 degrees Celsius at idle,

Tyrannosaurus GTX

The GT200 core is a massively monolithic monster, with a die size of 470mm² and a bloody huge 1400 *million* transistors used. Not only is it physically large, but it's also proving difficult to get high yields on, giving NVIDIA some money troubles. Still, it's what we're stuck with until the next NVIDIA core, rumoured for later in '09.

topping 70 under load.

A large copper base   with a series of heatpipes provides the contact with the honestly massive GPU core (see 'Tyrannosaurus GTX'), and takes the heat away to the thick aluminium fins. These dissipate the heat into the air, which then moves out the back of the card, and out of the case. Not only do they provide a good heat transfer system, but the fins run the length of the card and also make it physically strong, not bending or flexing like some longer cards. The card needs two 6-pin PCIe power connectors as well as the PCIe bus, but this is average for an enthusiast card.

Based around the GT200 core at a 55nm process, it's got one gigabyte of GDDR3 memory on a 512-bit memory bus, giving plenty of memory bandwidth and especially so when the overclocked memory speed is taken into account. This core is compatible with PhysX and CUDA, though the former will give you a slight performance hit.

This is essentially the same card as the GTX280, and has simply been shrunk down an extra 10nm while getting a nice increase in clockspeed. We couldn't push the core much further at all – it's already at the max stable memory, but we got to 720MHz on the core and 1550MHz on the shader.

Two DVI ports and an analogue video out are next to the vented PCI bracket, with the power status LED also here – it will light up green if you've got power in correctly, and red if you don't. Of course, the card won't work without power (making this kind of redundant), but for those who aren't tech-savvy it might have some attraction. The usual two SLI nipples are at the top of the card, allowing up to three GTX285s to be used together for a decent performance boost.

Bundled with the card is a full copy of GRID, which is an excellent choice and a great game – the more people who can get it the better. Not only that, but Zotac has also thrown in a copy of 3DMark Vantage Advanced, worth $US20, and if you register the card online within two weeks of buying it you'll even get an extra chunk of warranty on top – up to five years of it! For a pre-overclocked card with a great bundle and performance higher across the board (except Crysis, down by half a frame on average) this really is a nice choice. **JR**

Zotac GTX285 AMP Edition *3d Mark scores*

3DMark 06 – 14317

3DMark Vantage – P14845

Score

Zotac GTX285 AMP Edition *Gaming Benchmarks*

Crysis
Average 57.06
Minimum 35.12
Maximum 83.67

Race Driver GRID
Average 75.47
Minimum 60.00
Maximum 91.00

Frames per second

Performance — Big OC pumps up the benchies well. **91**

Bundle — Lapping the competition. **96**

Value — For all that, it's incredibly reasonable. **92**

Build — A little loud at times, but otherwise fine. **87**

Overall — A great choice for any GPU-hungry Atomican.

92%

Galaxy GTS250

Wait – we've seen this all before!

Street Price $TBA   **Supplier** Galaxy
Website www.galaxytech.com/

Specifications 738MHz core; 1100MHz (2200MHz effective) memory; 1836MHz shader; G92b core; 128 stream processors; 1GB GDDR3; 256-bit memory interface; dual-slot active cooler; one six-pin power connector

Card info www.techpowerup.com/gpuz/3d7gu/

16% OC

When a new card rocks around, we're usually incredibly excited – tech-lust takes over, and we dive into benching straight away. This one though, left us feeling used and abused, with the faintest sign of mockery underlying it all. Have a read of the boxout on this page for more, but for now we'll get on with the review.

The card is based around the same g92b core we've looked at for… well, over a year now. It's running the same clocks as the 9800GTX+ at 738MHz core, 1836MHz shader and 1100MHz memory. There's a decent 1GB of memory here as well, running on a 256-bit memory bus that provides a good enough bandwidth without being too expensive to use.

Physically the card is roughly the same length as a midrange card at nine inches, and echoes this with a single PCIe power connector instead of the two needed previously. It's got a plastic shroud around it, but this is made of very flimsy material that bends inwards when you grip the card. Underneath this shroud is the heatsink, a large aluminium block that runs the length of the card. It has a copper base, with heatpipes to move the heat away more efficiently to the aluminium fins near the PCI bracket. The entire heatsink is roughly machined, and exudes a budget feel from the dull glint and lumpy edges.

It's got a large squirrel cage fan that draws in air, flowing along the length of the card and venting outside the back of the case. This redesigned PCB means that all the memory chips are on one side of the card, so the GDDR3 used is cooled by the heatsink too. Temps at idle are 39 at 59.2dBA, and load is 57 with 60.2dBA, matching the 9800GTX+ identically.

The performance of the card, for something supposedly 'new', is depressingly bland. That's not to say it's poor by any sense – it's just exactly the same as what we've seen. There's a 100-odd point difference in 3DMark Vantage from the last 9800GTX+ we tested, and that's attributable to the extra memory and driver updates. Crysis and 3DMark06 share small increases, but again this is what you'd expect from a 1GB 9800GTX+. We're being smothered in mediocrity here, and there's nothing special about it at all aside from the name change.

Oh, at least the card has a green spider on it – that counts for something, right? If you've got any card from the 98xx series and up, give the GTS250 a miss. **JR**

Loose Lips Sink Ships

It's not a surprise to hear that we're not particularly impressed with this card. It's running the same core that was in the 8800GT/GTS, 9800GT/X/+ cards, and all it receives for it is a simple name change. The 1GB version of the card gets a PCB redesign to be shorter at only nine inches, but the 512MB version of this card is identical in every way, shape and form to the 9800GTX+.

Some vendors have even simply replaced the stickers on their existing stock – they're that identical. Now while we're used to the same core being used in multiple products, usually they're in the same family – chucking the G92 into the G2XX series gives off the incorrect impression that it's a GT200-based product, which it simply isn't. It's misleading to consumers, and serves simply as a strategy to fuel sales in the waning tech market out there.

NVIDIA need something (we suggest a good kick in the arse) to remind them that simply renaming something doesn't make it better – and we're not going to treat this as new at all.

Galaxy GTS250 *3d Mark scores*

3DMark 06 - 13205
3DMark Vantage - P8101
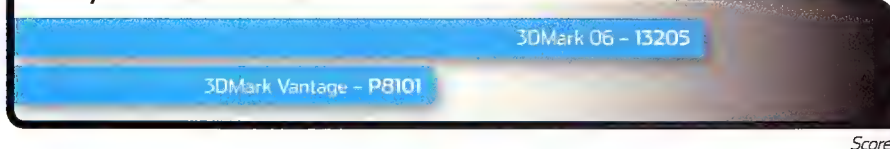
Score

Galaxy GTS250 *Gaming Benchmarks*

Crysis
Average 53.66
Minimum 34.70
Maximum 69.76

Race Driver GRID
Average 44.94
Minimum 38
Maximum 56.00
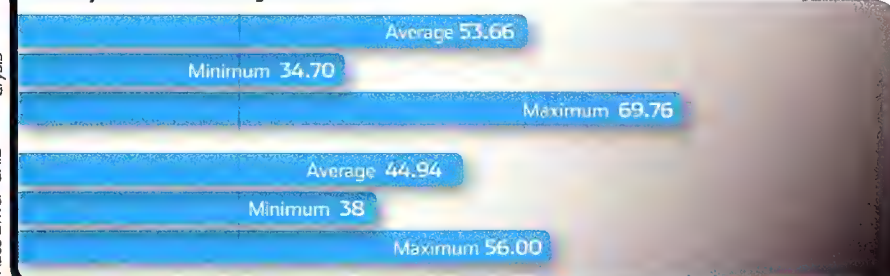
Frames per second

Performance
We've seen it before, overclocks well.
84

Bundle
N/A

Value
N/A

Build
Feels cheap, but shorter is nice for cramped cases.
74

Overall
Old tech doesn't need a third name when the first one worked fine.

79%

Manli 9600OC

Don't judge a card by its box.

Street Price $170 **Supplier** Bluechip Infotech
Website www.bluechipit.com.au

Specifications 650MHz core; 900MHz (1800MHz effective) memory; 1625MHz shader; G94 core @ 65nm; 96 stream processors; 512MB GDDR3; 256-bit memory interface; single slot active cooler; six-pin power connector

Card info www.techpowerup.com/gpuz/cbhg7/

Manli are a new brand in Australia, but has been manufacturing tech for many years (since 1996, in fact). Its kit has hit our shores courtesy of Bluechip Infotech, and there's a decent amount of it, too, with 180-300K cards and mobos made per month back in 2003 (according to their website).

Our biggest gripe with Manli gear is the packaging. Namely, we don't like the gender-confused childlike caricature of a robot on the front of it, with a sickly sweet grin on its face, balancing a wheel on a finger. For some reason the robot is in space, and doesn't seem like it would appeal to anyone but the lovers of oddly disturbing expressions – it's certainly not going to grab your attention with any level of seriousness on a shelf. But, like the old adage says, don't judge a book by its cover.

Ripping the internal box out of the outer cardboard sleeve, we pulled out the little card and plonked it down into our test rig. It's got a nice blue PCB that's just a shade greener than GIGABYTE's traditional colour, and the most prominent feature is the heatsink. Made by Arctic Cooling, it's a solid lump of aluminium with fins that raise up in the middle, and a large 80mm fan over the top that blows down to provide cooling for the core, and passes air over the RAM chips. Those same chips are sadly left bare, but this didn't prove too restrictive in use.

We recorded idle temps of 38 and a load of 45, with a constant 64.4dBA of noise. This is slightly too loud for our liking, though the three-pin fan should allow control of the speed through software. There's a 6-pin PCIe power connector required for use, a single SLI nipple at the top of the card for up to two cards in a system, and two DVI ports with a solitary analogue video out. Nicely, there are only solid caps used on the card, and the cool running temp should give it a long life.

It's based on a cut-down version of the G94 core, and is actually a 9600GSO. 512MB of memory on a 256-bit memory interface provides a decent amount of memory space and bandwidth. Running standard clocks of 650MHz core, 1625MHz shader and 900MHz memory, we didn't expect massive increases out of the card – but we damn well got them.

We pushed the card all the way to a perfectly stable 730MHz core, 1825MHz shader and 939MHz memory speed, adding 746 points to the 3DMark06 score with only a little time invested. Temps weren't a problem either, thanks to the AC heatsink used. Performance at stock was what we can expect of this core, but don't expect to be able to run many games at the 1920 x 1200 @ 8xAA we run GRID at – it was like a slideshow at times.

The bundle is pretty light for the card, with no game included, just all the usual cables that you can expect. Still, it's a great card for beginner overclockers, and shouldn't hurt your wallet too much either. If only they'd change that robot... **JR**

Fan Control

Many cards take control of their own fanspeed, increasing or decreasing them as they see fit. If your card has a three or four pin power cable for the fan (easily checked visually), you can change it using software such as the popular Rivatuner. If you don't mind the noise, throw it up to 100 per cent and see how far you can push your OC!

12% OC

Manli 9600OC *3d Mark scores*

3DMark 06 – 9347
3DMark Vantage – P4198

Score

Manli 9600OC *Gaming Benchmarks*

Crysis
Average 21.40
Minimum 4.49
Maximum 38.95

Race Driver GRID
Average 20.02
Minimum 13.00
Maximum 26.00

Frames per second

Performance Decent at stock, but an amazing OCer.	82
Bundle Bare necessities.	75
Value A fair price.	74
Build Keeps cool, if a little loud.	88

Overall
Great fun to overclock, and an impressive first showing for Manli.

83%

Plantronics Gamecom 367 Headset

This heavy-duty kit can take AND give a beat(ing).

Street Price $50 **Supplier** Anyware
Website www.anyware.com.au

In a throwback to the solidly-built audio gear of the past, Plantronics' Gamecom headset was met with more than a few quizzically raised eyebrows around the Labs – it's very old school in appearance. In functionality though, it's every modern convenience you can expect from your audio gear, especially for the target audience of PC gamers.

It's got a cable length of approximately one tech writer (just shy of two metres), which is rubber-coated with a texture almost like liquorice. There is a handy control unit that can alter volume through a large wheel, and turn the inbuilt mic on and off. The connectors are gold plated 3.5mm audio jacks, standard for any decent product.

At the other end of the cable, it attaches to the left-hand cup securely in a thick plastic mould. Each cup is very large and deep, and each fits into an open palm to fill it completely. They're made of tough plastic, and are closed to keep out external noises at the loss of cool air – these got a little toasty after extended listening, but shouldn't be too much of a problem once you're used to them.

The cups house a 40mm speaker driver, which has a frequency response of 20 – 20,000Hz. There's also a mic boom that swings down over the left cup, and tucks neatly out of the way into the headband when not in use.

The headband itself is made of the same tough plastic as the cups – you can chuck this set around and not be too worried about it. There's a thick cushion-ey felt-covered foam used around the cups, and just underneath the band, though the whole headset never feels heavy. It's got nice sound too – with just a hint of extra bass and a slight inability to handle the really high-end frequencies. For fifty bucks, however, it's a steal. **JR**

Overall
Cheap, good sounding audio, even if it is a little warm at times.

87%
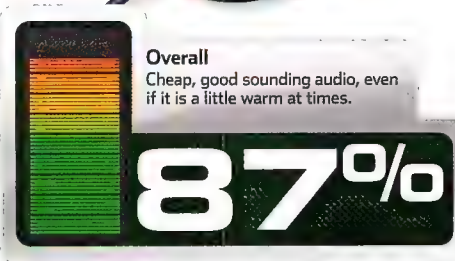
Xigmatek Thor's Hammer

The Norse God of Thunder's latest weapon.

Street Price $111 **Supplier** Multimedia Technology
Website www.mmt.com.au
Specifications Tower heatsink, 7 heatpipes, aluminium with nickel plating, no fan included - compatible with 120mm
Gallery link www.atomicmpc.com.au/?138904

We fell in love with this heatsink at first sight. From the individually mirrored fins, to the intricate sandwiching design that reminds us oddly of a carpark, and lots of cool history behind the name (see the gallery above), this is one heatsink that is oozing awesomeness.

It's a tower cooler with a flat top that is reflective enough to see yourself, and is unmarked by heatpipes poking through the top. Each layer of fins rests against the surrounding fins to provide a huge amount of stability – we'd actually have to try to bend the fins to get them to move.

The base is the most interesting part however, since it uses the Direct Touch method of sanding the four 8mm heatpipes to directly contact the Integrated Heat Spreader (IHS) of a CPU, and take the heat away more efficiently. It's very smooth and flat, but small gaps between the heatpipes are left. There are a further three 6mm heatpipes that are mounted just above the larger ones, and all seven pipes are bent into a U shape to give fourteen paths for heat to travel.

Compatibility isn't an issue either, and it includes support for LGA1366, LGA775, AM2, 939, and 754. Simply screw the right bracket on the heatsink, and mount it to the mobo. Fans are attached via rubber nipples, although none are included – the heatsink cannot handle the heat of our i965 even at idle without airflow.

It performed admirably at stock settings, but when we bashed in our overclock and higher voltage, then ran OCCT to load the CPU it couldn't handle the heat – and crashed at 84 degrees even with two fans. This isn't to say it isn't a good heatsink (Nehalem is incredibly hot), and it'd be perfectly fine for any C2D-based CPU. Just make sure you pick a good fan for it! **JR**

Overall
Incredible looks, but no fan. Can't handle OC'd Nehalem.

85%

Xigmatek Thor's Hammer

	Load 1 Fan	Idle 1 Fan	Load 2 Fans	Idle 2 Fans
3.2GHz, 1.2V	76	44	72	42
3.6GHz, 1.35V	84 - crash	46	84 - crash	44

OCZ Apex 120GB

SSD - now in orange!

Street Price $545 **Supplier** OCZ
Website www.ocztechnology.com/
Specifications 120GB; 2.5in form factor; SATA 3Gb/s

Good, fast storage for a gaming rig is pretty desirable, since you'll need to have room for your OS as well as the huge amount of games, programs and media files stored. The problem you run into eventually is speed – the more stuff you have installed onto a single drive, the more it has to work to access the information for everything at once, and it'll seem quite slow.

The solution to this is either to add another traditional Hard Disk Drive (that is essentially magnetically charged discs and reader heads that rotate very fast), or to add a Solid State Drive, also known as SSD. This is an attractive choice; being solid state means that there are no moving parts that can wear down or break – but that's not to say they're perfect either.

Each write operation of a cell in the drive (copying a file, for example) will cause that cell to wear down a little electrically, and eventually

it won't be able to hold any information. Write-level algorithms are used in SSDs to spread these writes all over the cells of the drive, to limit specific areas wearing thin sooner.

This drive has 120GB of flash, giving 117GB of usable space. Plenty of space for everything you'd need, and the speed is no slouch either – with an average read of 177.7MB/s, maximum burst of 235.2MB/s and an access speed of only 0.2ms. It averaged roughly 100MB/s when we messed around copying files, and was very snappy throughout testing.

It did seem to get a little warm compared to other SSDs we've looked at, but this didn't pose a problem even after many hours of use. It's not limited too much by space, and the price is accessible enough for the serious enthusiast

to consider it as a real option – after all, who can touch the coolness factor of having an SSD-powered rig? **JR**

Overall
Fast, large and in charge.

90%
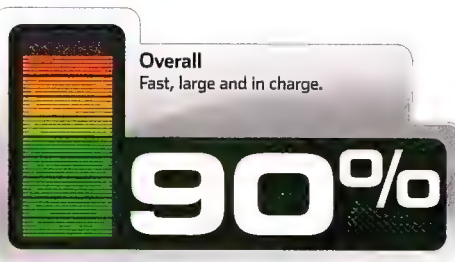
Scythe Mugen 2

Grim Reaper's knocking on the door – can Scythe survive?

Street Price $84 **Supplier** Scythe
Website www.scythe-usa.com/
Specifications TTower heatsink, 5 heatpipes, aluminium, 120mm SlipStream fan
Gallery link www.atomicmpc.com.au/?138233

We haven't looked at anything from Scythe since our big heatsink roundup in Issue 89, so when we got wind of the Mugen's successor coming out, we knew we had to grab one for review. It's a tower heatsink that's just a little wider than some, but is split into five identical heatsinks, with a single heatpipe curling into either side. There's five heatpipes used in the design, and they're all bent to give essentially two paths for the heat to travel, meeting in the middle at the nickel base.

The base is exceptional; smooth as a mirror and just as reflective, while the smaller heatsink sandwiching the heatpipes to it is a nice extra

source of dissipation. Compatibility is king here – luckily every socket since Intel's 478 and AMD's 754 is covered. Intel's latest LGA1366 is also here, but installation is not easy.

It involves taking apart the LGA1366 socket (we're so not joking), and replacing the stock back plate with one included by Scythe. Then the mobo is upended and balanced on the heatsink while you screw it in – this might be quite daunting for a newbie at times, and the instructions consist of only two pictures for it. Also remember that while the socket is apart, there's going to be nothing holding the CPU in – keep it somewhere safe.

Thankfully once installation was out of the way it was a refreshingly good performer, keeping our i965 cooler at idle than even the Thermalright Ultra 120 Extreme can. Not only that, but it also passed our burn-in test with the single included fan (which makes 61dBA of noise), and can handle up to four fans if you get more brackets, or MacGyver some yourself. It's a solid piece of kit, and it's even cheaper than the TRUE while adding a fan, giving great value for money. **JR**
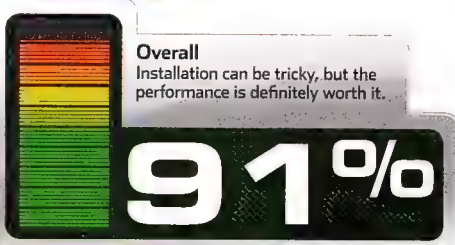
Scythe Mugen 2

	Load	Idle
3.2GHz, 1.2V	61	37
3.6GHz, 1.35V	83	42

Overall
Installation can be tricky, but the performance is definitely worth it.

91%

SilverStone SG04

Pint-sized portable case – with a handle!

Street Price $211 **Supplier** Altech
Website www.altech.com.au
Specifications: 200 x 360 x 347mm (W x H x D); 1 x 120mm Fan (front); 1 x 5.25in drive bay (external); 2 x 3.5in drive bay (internal); 1 x 3.5in drive bay (external); M-ATX, ITX; aluminium panelling, steel structure.
Gallery Link: www.atomicmpc.com.au/?136875

We're usually about the biggest stuff here at Atomic, whether that be the biggest heatsink, benchmark score or even case. SilverStone's gear is usually pretty big too – some of its cases make some cars look puny – but this one has been downsized more than pair of pants from a survivor of the Subway diet.

To get a handle on the situation, we wrestled one of the cases from a SilverStone rep (also known as "asking politely for one"), and took quite a lot of time taking photos, which you can see in the gallery link at the top. Even without those though, the dimensions of the case are probably the most noticeable and important feature. It's only compatible with mATX or ITX boards, but we've heard through the grapevine that mATX X58 boards will be hitting the shelves very soon, so you won't have to compromise on performance.

Starting at the fascia of the case, it's constructed from finely brushed and anodised black aluminium, with two grooves either side providing an intake of cool air, and an only-very-slightly mushy power button. There's a single 5.25in bay here, with a stealthed eject button. Alternatively there's a bay cover included in the package that will fill this void if you're not using it.

The left-hand side of the fascia is a stealthed and hinged piece of aluminium, which swings out and opens to reveal a reset button, two USB, Firewire and mic/audio ports. There's also a 3.5in drive bay here that can be used for a Fan Controller, card reader or anything really (though Floppy drives aren't really all that useful any more). In a pinch it can also be used to hold a HDD.

The left-hand sidepanel has a meshed window surrounded by a plastic baffle that allows in some nice airflow but won't cut down on system noise at all. Opposite this is the other panel, which is plain, and both panels are made of brushed aluminium. Up on top of the case is a thick aluminium handle with bevelled holes drilled through it (we guess for a looks/weight reduction/cost saving thing) – this handle is sturdy enough to lift the entire case and hardware without worrying about it breaking.

Around the back of the case there are four PCI slots in the usual mATX location, with plenty of ventilation around them. Just above those is the I/O area, as well as a sidewards-mounted PSU stand. At the very top of the back there is, strangely, another PCI bracket whose purpose seems just to be giving you an area for a fan controller or similar; at least it provides some more airflow.

After taking the sidepanels off by unscrewing the thumbscrews and simply pulling them off (they're a little stiff the first few times, but eventually work free) there seems to be a bracket in the way – but why? It's actually where the PSU will rest when installed, and doubles as the mounting area for the external 3.5in bay. Three screws come out, and the bracket pulls away to give access to the tiny space inside.

There's a single 120mm fan at the front for cooling (and space for another), while two HDDs can be installed in the floor of the case, which unscrews and pulls down to get them in. The mobo is installed first with heatsink attached, then the drives installed and cabled, and finally you plug in the PSU and then attach it to the case – this isn't a case for inexperienced builders.

It is, however, a great little case for either a LANing rig, or even just a full-fledged PC, but watch the clearance for the CPU heatsink – 82mm is the height limit. You can also fit in graphics cards up to 10.5in, so grab those GTX285's and get going! **JR**

Build 94
Sturdy, well finished and workable even

Value 81
Decent, but another fan included would be nice.

Cooling 72
Should be just enough in this small volume.

Features 93
Everything has been thought out quite well.

Overall
The ultimate hardcore portable miniature rig enclosure.

85%
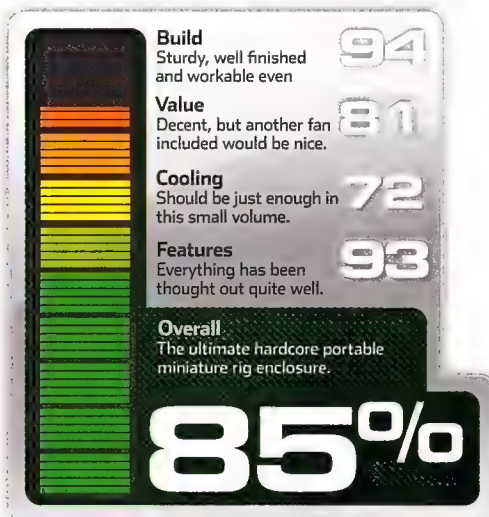
Zalman GS1000

The mysterious case of the plastic, steel and aluminium monster.

Street Price $300 **Supplier** Altech
Website www.altech.com.au
Specifications: 220 x 560 x 580mm (W x H x D); 1 x
120mm Fan (top); 1 x 120mm Fan (rear); 4 x 5.25in drive
bay (external); 6 x 3.5in drive bay (internal); EATX, ATX,
M-ATX; Aluminium/steel; 12kg.
Gallery link http://www.atomicmpc.com.au/?138443

If you've got something from Zalman already, you'd half expect this to be something you'd slap down onto a CPU or GPU to cool it – certainly the name lends itself to that expectation. You'd also be wrong – this is a case, and while it probably could do a decent enough job of cooling a CPU if it was ever possible to mount it well enough, that would be incredibly impractical, so we'll stick to its normal use – whacking all your gear in and protecting it from the dust-filled outside world.

The GS1000 is a strange beast that uses the three main materials mentioned at the top of the page extensively; most noticeably on the front of the case. The fascia is a plastic frame that feels very soft (the scratches that developed under light use were a little off-putting), and mounts onto the steel body of the case. Four 5.25in drive bay covers are made of the same plastic, while the power button is steel and ringed with transparent plastic to let the power LED shine through. There is no reset button anywhere on the case, which will prove to be very annoying to most.

Down the front of the case are two flip-down aluminium covers that hide six toolless HDD caddies, the top three of which are hot-swappable. These proved incredibly annoying in practice – every time we'd pick up the case one

of the doors would swing down – though it was mildly amusing to see which of the two it'd be each time.

Front-panel-bashing aside, the side panels of the case are lavishly formed brushed aluminium, elegantly curved at the foremost end and with a plastic handle at the back to ease removal. They're secured with thumbscrews, which screw in just a little further than most to hold the panels on even tighter than other cases, something definitely appreciated. This quality doesn't lend itself to the top of the case, however. It's just a plastic shell on top with a WW2-esque bunker to allow ventilation in. I/O ports are standard fare, with Firewire, two USB, and 3.5mm audio/mic ports.

There are twin watercooling grommeted holes at the back of the case, as well as seven polished aluminium PCI brackets and some ventilation. Ventilation is actually the most disappointing part of the case – with only two 120mm exhaust fans, one at the top and back, airflow is severely wanting. The HDDs don't get any direct airflow either, something that might prove irritating down the track. After all, there's nothing like gently cooked HDD platters.

Inside the case is a large enough space to fit a fully-stocked EATX board and everything below that, as well as the longest PSU you can find. There are a series of grommeted cabling holes in the motherboard tray that allow easy and neat cabling, with plenty of room behind to fit the thickest of cables.

The PSU is attached to a bracket, which then slides in the bottom of the case from the back on two little plastic rollers, though no vibration
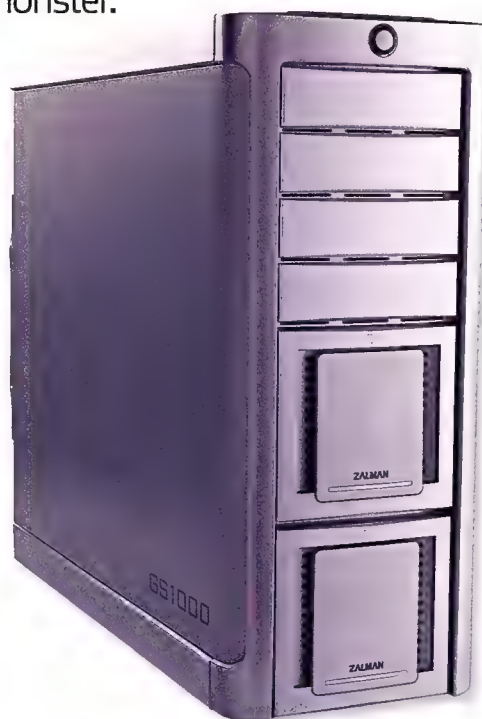
dampening has been used. This might cause some noise. The only place that has dampening material are the sidepanels – a thin strip of rubbery foam at the top and bottom edges. One cool innovation we did find was the 5.25in bay securing method – spring-loaded thumbscrews that are attached to the case, and once released from the drive simply hang there and can't be lost, which is very handy for those clumsier folk out there.

Overall this case is a confused case that doesn't really know what it wants to be – ultra-enthusiast features clash with budgetesque ones to leave us with one word – huh? **JR**
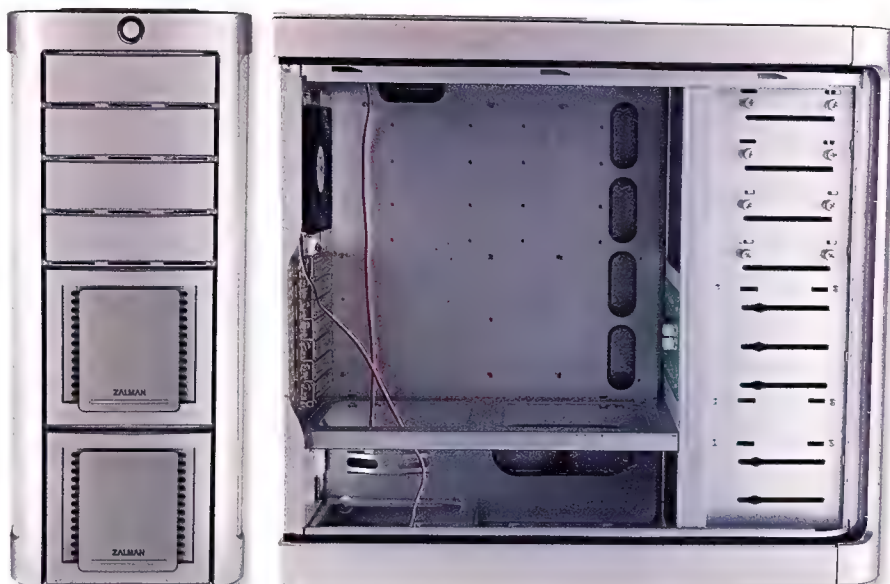
Build 70
Just functional at times, exquisite at others.

Value 69
Could be worse for a case this size.

Cooling 64
Only two fans in a $300 case? Huh?

Features 78
Some nifty innovation and solid thinking.

Overall
Confounding decisions and clashing choices make this one case that is difficult to recommend to everyone.

72%

Antec Sonata Elite

New enough to miss out on a PSU?

Street Price **$175** Supplier **Altech**
Website www.altech.com.au
Specifications: 205 x 481 x 440mm (W x H x D); 1 x
120mm Fan (rear); 3 x 5.25in drive bay (external); 4 x
3.5in drive bay (internal); ATX, M-ATX; steel; 9.8kg.
Gallery Link: www.atomicmpc.com.au/?139534

Antec has made a voluminous amount of cases over the years, and Atomic has loved some while liking others not quite so much. They're one of the biggest manufacturers of cases though, so they must be doing something right – right?

This case is called the Elite, supposedly because it's the culmination of all the best features from predecessors in the series. The lineage is definitely seen in the fascia, retaining the same curved black plastic shell with grooves either side and an I/O panel running across the middle. It's got two USB, an eSATA and mic/

Why/O Shield

Back in the era of beige boxes, the I/O shield plate (that rectangle at the back of your case where USB ports and such reside) was pretty likely to be compatible with the motherboards at the time – after all, they didn't vary much. Now though it's a superfluous waste of material, and it's 99 per cent likely you'll be chucking it away. We're not sure why they haven't stopped including it, but if it slashes even a buck or two off the price of the case then we're all for it! This is for all cases, not just Antec, and most manufacturers are guilty of this.

audio, with two pinholes containing blue power and HDD LEDs. The 5.25in drive bays are hidden behind a half-height door at the top, which swings open to show three bays as well as a slick power button, and just-too-small reset button. You'll have to either cram a fingernail in there to activate it, or keep a pencil around with you! That door is also key-lockable, to keep prying kiddy fingers out of there.

The left-hand sidepanel is bare, with only the very reflective black paint to show anything of interest. It's quite smooth to the touch, but fingerprints horribly, and also looks just like an orange peel in the light. There's more action at the other sidepanel, with a large intake vent similar to something we'd see from Alienware providing fresh air for the HDDs inside. The top of the case is bare too – just the black paint again. Oddly there are no intake fans anywhere at the sides or the front of the case, meaning that the entire case will have a negative pressure inside – dust is going to be sucked in here faster than balanced or positive pressure cases, just like a vacuum cleaner (or miniscule black hole).

Around the back of the case is where we find the only 120mm fan used in the case, which has a switch to modify the speed. The PSU is mounted in the standard ATX design at the top, an I/O shield, seven PCI brackets and a grille with two screw holes above and below it. This grille is where the 90mm blower-style fan is attached (included in the box), and provides another exhaust that should remove the hot air
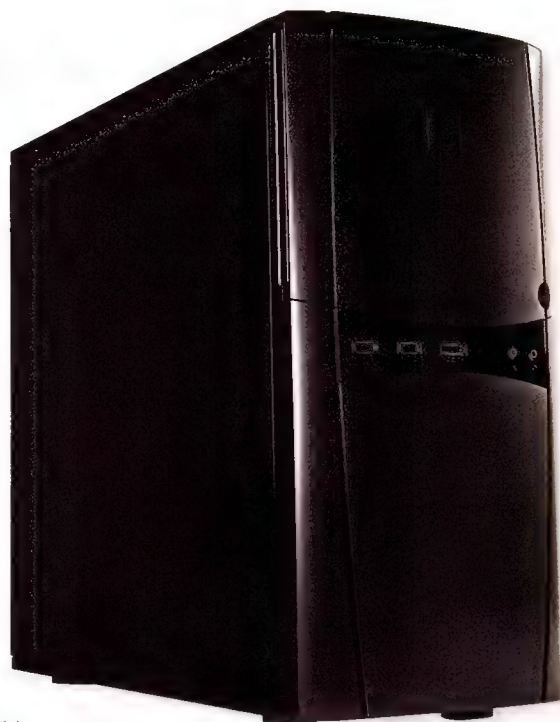
from the expansion cards – but also add to the negative pressure.

Inside the case we've got an area that can take up to ATX-sized mobos, with small holes precut for cabling. These aren't grommeted, but shouldn't cut up your cables too badly (unless you yank them very hard). The I/O cables are threaded neatly to this area, and the PSU will sit on a sturdy pair of rails for support.

HDDs are installed with thumbscrews and have silicon anti-vibration rings around them, while the 5.25in bays have the Antec rail system. Only four HDDs might be restrictive for some, but should be enough for most.

Overall this is a case with not enough airflow, and for only ten bucks more you can grab the Sonata III and get a nice 500W PSU included – this one doesn't have one at all. **JR**

Build Sturdy steel construction, with **88**

Value Decent price, but no PSU hurts the attraction. **75**

Cooling Watch the dust, no room for more fans. **76**

Features An interesting take on HDD mounting and **80**

Overall Not for everyone, but a solid enough choice for the budding budgeteer.

81%
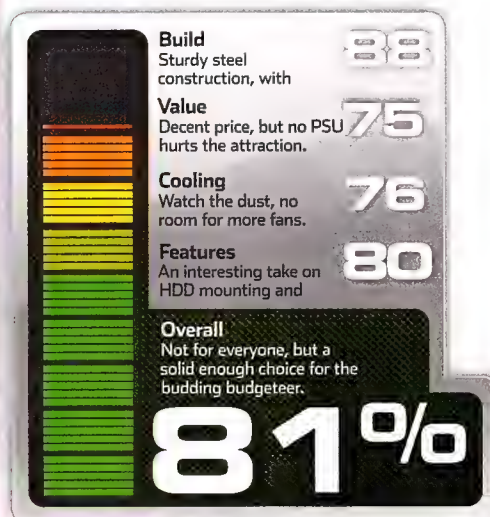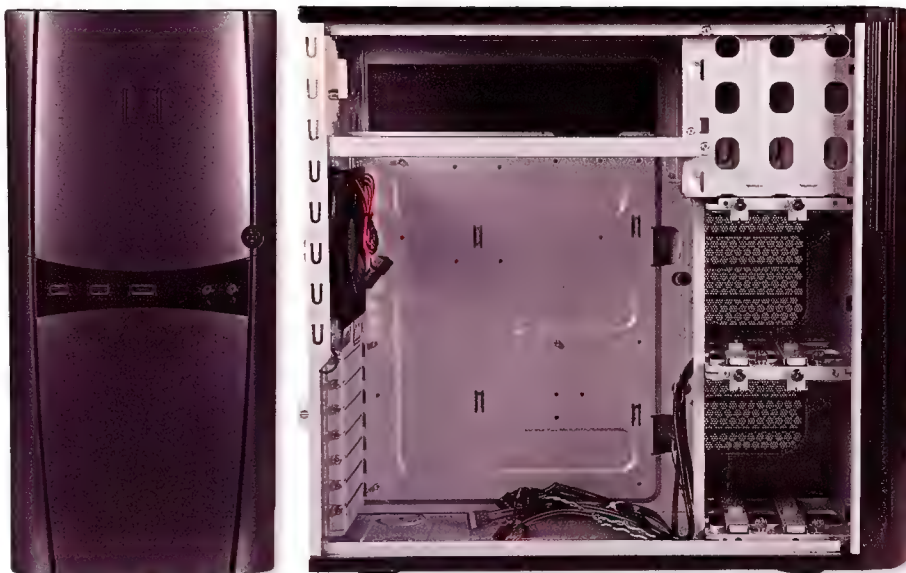
Nirv Gaming PC

A gaming machine that really strikes a nerve.

Price $4943 **Supplier** Nirv
Website www.nirv.com.au

Specifications: Intel Core i7 920 (overclocked to 3.8GHz); Thermalright Ultra 1366 eXtreme; ASUS P6T X58 mobo; 6GB G.Skill RAM 1333MHz CL9 (overclocked to 1520MHz @ 9-9-9-24); Palit GTX295; OCZ 128GB SSD + 1TB Samsung HDD @ 7200rpm; Silverstone ST1000 PSU; Coolermaster HAF 932; LG Bluray/HDDVD combo drive; Vista x64

Gallery link http://www.atomicmpc.com.au/?138443

We haven't looked at anything from Nirv before, so when they offered us a beastly rig we leapt up and down for a while, then remembered we had to answer – and said yes. It shipped in the standard packaging for the Coolermaster HAF case it resides in, with sturdy foam and a plastic bag over the top.

Outside it's the standard HAF design – there isn't really anything that's been changed from the stock config, apart from the addition of tech inside.

Tech specs of the Nirv are pretty awesome too; built around ASUS' P6T X58 motherboard, it's got everything you'd really need. A core i7 920 chip resides in the board, which has been overclocked to a QPI of 190MHZ; an effective speed of 3.8GHz. Six gigabytes of DDR3 memory are here too, but sadly they're a slow kit at only 9-9-9-24 timings. The QPI overclock does bump their frequency up to 1520MHz though, so they're not incredibly restrictive (we'd tighten those timings and lower the frequency, or grab some 1600MHz CL8 instead). Graphics grunt is provided by a Palit GTX295, pumping out the frames very nicely. Because the graphics card has 2GB of memory as well as the six gigabytes of system memory, Vista x64 has

been used.

Cooling is a Thermalright TRUE 1366, oriented upwards to exhaust hot air vertically – this takes advantage of the side intake below the cooler, and exhaust at the top. An idle temp of 43 degrees was recorded on the CPU, so it's definitely got a great amount of airflow to keep things very cool.

Having a lot of hardware grunt means nothing without space and speed to keep the OS and games/media, and Nirv has thoughtfully provided both – an OCZ 128GB SSD keeps the operating system sliding along at a very fast speed, while an entire terabyte of traditional HDD space gives a ton of room for most people.

Gone are the days of the giant spaghetti mess of cables inside a powerful rig – the Nirv manages to tuck excess cable behind the mobo tray, behind the PSU, and the drive cages. Not only have they hidden what is there but they've also cable tied everything into place, and even the front panel connectors are cable tied neatly.

Performance is what it all comes down to at the end of the day, however, and the Nirv performed exceptionally – we recorded a massive 22154 points in 3DMark06, with an average framerate of 56.65 in Crysis. This is almost the 60fps max that a monitor can display, and if you're going to be gaming at all you'll want these kinds of silky smooth frames to reduce the stuttering and juddering that you get around the mid-thirties or lower.

The only downside to so much performance is an equal amount of heat and noise– the GTX295 and overclocked i920 pumped out a significant

chunk of mercury-rising goop into the Labs (also known as heat), while making a rather large racket. Thanks to the relatively small GPU fan, it whirred away while the larger fans of the case span as well, keeping an ignorable noise at idle but a distracting one under load.

One problem that arises from all those moving fans is vibration, and the entire chassis was a-bumpin' on the bench enough that we could feel it along the length of the tabletop. This isn't a dealbreaker, but just something to keep in mind if your system sits up on the desk with your mouse and keyboard.

The price is rather high, but for a well-cabled and built system there's definitely enough gear here to warrant a very hard look – this is a gaming machine that isn't going to let you down for a long while yet. **JR**

Build
A very beastly bencher. **94**

Value
Not the best, but includes a lot of tech. **81**

Build
Cables neat, decent tech choices. **95**

Features
While nothing lasts forever, upgradable like nothing. **97**

Overall
A gaming system that anyone with enough cash will be proud to call their own. **91%**

[PART I]
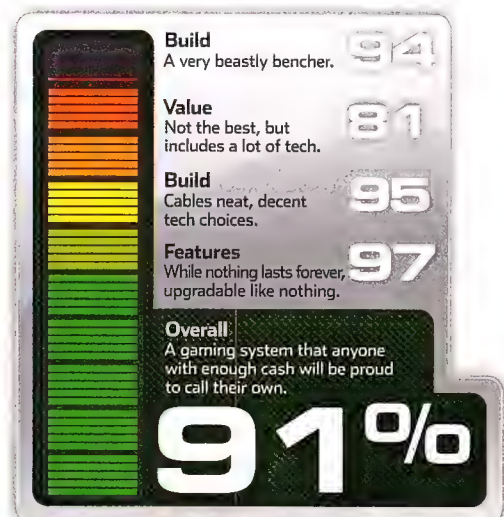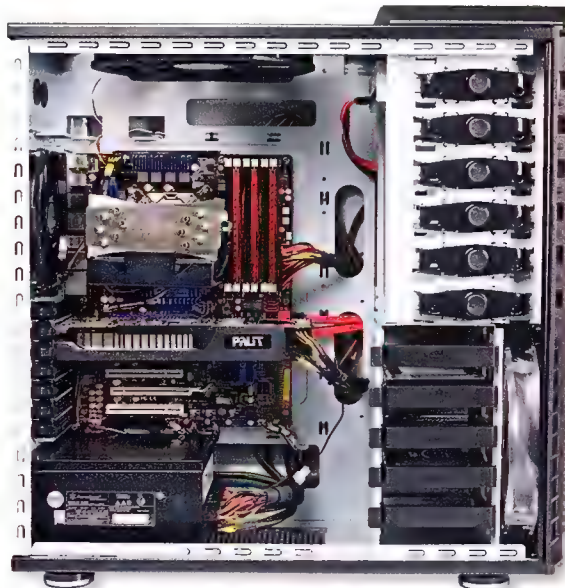
Budget Busting Upgrades

Don't break the bank when you're building your next PC!

Although it's fun to plan which components you'd buy if you had an unlimited budget to spend on a new PC, there comes a time in every enthusiast's life when they need to build a new system on a tight budget. Whether you're building a second PC while your overclocked rig is being rebuilt, a system for your children/significant other, or a PC for university, this Labs test details which components you need to buy.

While the choice of case and other peripherals will have an effect on the finished PC, the two most important components to consider are the CPU and motherboard. For this Head2Head, we rounded up a selection of each component, all very reasonably priced, so you can find out which case components to buy to build a great PC on a tight budget.

The first section of this Labs test looks at the cheap and cheerful segment of the CPU market, while the second parts (coming up in next issue) look at a selection of LGA775 and Socket AM2+ motherboards.

Incidentally, if you pair this with our Budget Graphics Card Head2Head from a few issues ago (and online here **www.atomicmpc.com. au/?137568**), you'll have the makings of a very good – and well-priced – system.

So, to find out which components you should buy to build a budget-busting PC that will give many much more expensive PCs a thorough kick up the backside, read on.

CONTENTS

AMD Athlon X2 Series

The 4850e is an ideal choice for a cheap PC

➕ The 6400+ is cheaper and faster than a triple-core Phenom
➖ Low power efficiency; limited overclocking

This series of dual-core CPUs has been in production for so long that in early 2008 AMD changed its name, quietly dropping the 64 from the middle. Quite what precipitated this change is unknown to us, but AMD has a long history of releasing different CPUs with the same name, and employing other confusing branding practices.

Ironically, the most powerful member of this series, the 6400+, is the oldest. It's based on the aging Windsor core, so it's made using a 90nm manufacturing process. This means that it consumes considerably more power than

the other members of the series and just 1W less than the triple-core Phenon X3 8750 Black Edition (see over page). However, the 1MB of Level 2 cache per core and 3.2GHz frequency makes the 6400+ faster than the Phenom X3 in most tests. Due to its large transistors and high power consumption, the 6400+ isn't very overclockable.

Other models in this series are based on the 60nm Brisbane core. This means that they consume less power, run cooler and are slightly better overclockers than the 6400+. Clock frequencies vary between 2.5GHz and 3.1GHz, but all models are equipped with 512KB of Level

2 cache per core.

The more expensive models aren't very competitive, but the 4850e is a good choice if you're on a tight budget and don't fancy overclocking. Despite costing the same as Celeron E1400, it's significantly faster in both games and applications, and thanks to its energy-efficient 'e' branding, it consumes very little power. If you aren't confident about overclocking then it's definitely worth considering.
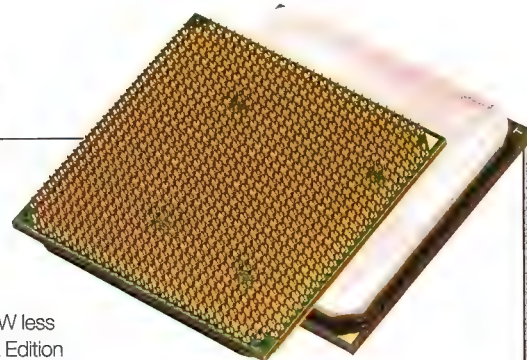
CPU	Packaging	Frequency	Core	Number of cores	HTT	Cache	Price
Athlon X2 4850e	Socket AM2	2.5GHz	Brisbane	2 x physical	200MHz	2 x L1 = 128KB, 2 x L2 = 512KB	$137.00
Athlon X2 5050e	Socket AM2	2.6GHz	Brisbane	2 x physical	200MHz	2 x L1 = 128KB, 2 x L2 = 512KB	NA
Athlon X2 5400+	Socket AM2	2.8GHz	Brisbane	2 x physical	200MHz	2 x L1 = 128KB, 2 x L2 = 512KB	$129.00
Athlon X2 5600+	Socket AM2	2.9GHz	Brisbane	2 x physical	200MHz	2 x L1 = 128KB, 2 x L2 = 512KB	$147.40
Athlon X2 6000+	Socket AM2	3.1GHz	Brisbane	2 x physical	200MHz	2 x L1 = 128KB, 2 x L2 = 512KB	$170.50
Athlon X2 6400+	Socket AM2	3.2GHz	Windsor	2 x physical	200MHz	2 x L1 = 128KB, 2 x L2 = 1MB	$189.20
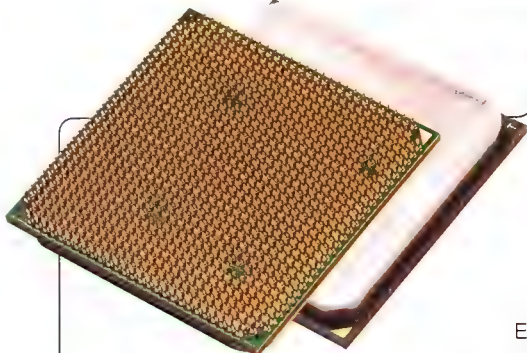
AMD Athlon X2 7750 Black Edition

Phenom X2 finally arrives, but it's branded as an Athlon X2

➕ The unlocked multiplier makes it easy to overclock
➖ Significantly slower than an overclocked Pentium E5200

The 7750 Black Edition is the latest addition to the Athlon X2 series, but we felt that it was worth reviewing separately, as it's based on a completely different core design. Although it's based on the same AMD64 architecture, the 7750 Black Edition has more in common with Phenom than other Athlon X2s.

In fact, there are so many similarities between the 7750 Black Edition and Phenom that we wonder if it's the same Phenom X2 that AMD announced two years ago but never launched. And it isn't only ourselves either – CPU-Z is convinced that the 7750 Black Edition is actually a Phenom.

Unlike the other Athlon X2s, the 7750 Black Edition is Socket AM2+ instead of Socket AM2, so it has separate voltage planes for the CPU cores and integrated memory controller. Its two cores are each equipped with 512KB of Level 2 cache and are clocked at 2.7GHz. Like a Phenom, both cores have access to 2MB of Level 3 cache, and as it's a Black Edition, the CPU multiplier is unlocked for easy overclocking.

Costing just under $150, the 7750 Black Edition is priced midway between the Athlon X2 6000+ and 6400+. This is sensible move on AMD's part, as it also performs midway between these two processors, achieving a reasonable score of 830 in our Media Benchmarks. By raising its vcore from 1.312V to 1.5V and its CPU multiplier from 13.5 to 15.5, we successfully

overclocked the 7750 Black Edition from 2.7GHz to 3.1GHz. This provided a very welcome performance boost, boosting its Media Benchmark score to 927, although Crysis barely saw any improvement.

While the 7750 Black Edition is very easy to overclock, it's a rather pointless addition to the Athlon X2 family. Being stuck between the 6000+ and 6400+ models means that it's beaten into a bloody pulp by the similarly priced Pentium E5200, which is easily overclocked to well over 3.5GHz. It's interesting to see Phenom X2 finally arrive, but it's too little, too late. However, if AMD can release a Phenom II-based 45nm version that overclocks better in the next few months, it may be able to reclaim the dual-core market from Intel.

CPU	Packaging	Frequency	Core	Number of cores	HTT	Cache	Price
Athlon X2 7750 Black Edition	Socket AM2	2.5GHz	Kuma	2 x physical	200MHz	2 x L1 = 128KB, 2 x L2 = 512KB, L3 = 2MB	$149.90

AMD Phenom X3 8750 Black Edition

Slower than a dual-core CPU in most games and applications.

➕ Easily overclockable to 3GHz

➖ Consumes a lot of power
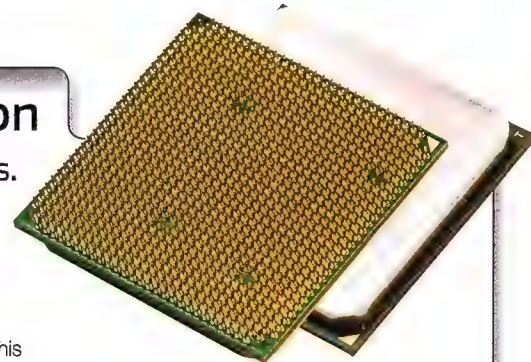
Launched six months after the original quad-core Phenom X4 CPUs, the Phenom X3 series was designed to fill a very specific niche. The theory was that if you couldn't afford a quad-core CPU, but wanted more performance than a dual-core CPU could deliver, you might be interested in buying a triple-core CPU.

As such, the Phenom X3 8750 is the only CPU with more than two cores available for its price point. Rather than being designed from the ground up, the Phenom X3's Toliman core is based on the Agena core used in the first Phenom processors, with one of the four cores disabled. Each of the three cores is clocked at 2.4GHz, and has 128KB of Level 1 cache, 512KB of Level 2 cache and

shared access to 2MB of Level 3 cache. As this is a Black Edition model, the CPU multiplier is unlocked, so the chip can be easily overclocked without having to worry about configuring the frequency of the HTT or RAM.

While in theory there's nothing wrong with a triple-core CPU, the Phenom X3 8750 Black Edition is a little too much like compromise. For example, its overall score of 813 in our Media Benchmarks is significantly slower than several of AMD's own cheaper dual-core processors, such as the Athlon X2 6400+ and 7750+. The Phenom X3 is also slower than these CPUs in games, only managing to edge ahead in the highly multithreaded Cinebench R10 and WPrime tests.

By increasing the CPU multiplier from 12 to

15 and the vcore to 1.4V, we successfully overclocked the Phenom X3 8750 Black Edition from 2.4GHz to 3GHz. Although this significantly improved its performance, it still proved unable to beat the overclocked Athlon X2s in most tests.

It's one thing for your competitor to release a faster CPU, but even so, the Phenom X3 8750 is inferior in almost every regard to the cheaper Athlon X2 series. Even worse, the similarly priced Core 2 Duo E7300 and cheaper Pentium E5200 are even faster than AMD's dual-core CPUs, and they're far more overclockable too. Despite the three cores, you're better off buying a dual-core CPU.

CPU	Packaging	Frequency	Core	Number of cores	HTT	Cache	Price
Athlon X2 7750 Black Edition	Socket AM2	2.4GHz	Toliman	2 x physical	200MHz	3 x L1 = 128KB, 3 x L2 = 512KB, L3 = 2MB	$250.00

Intel Celeron

Very slow at stock speeds, but they are amazing overclockers.
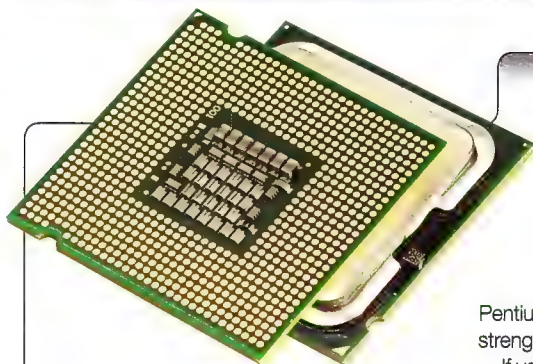
➕ Massively overclockable; very cheap

➖ Poor performance at stock speeds

Intel Celerons are more at home in office environments, and struggle with demanding tasks such as media encoding and gaming. This was evident in the majority of our benchmarks, as both the E1200 and E1400 were trounced at stock speeds, even by the slowest AMD processor present on test, the Athlon X2 4850e.

The main reason for this is their pitiful amount of Level 2 cache – just 512KB shared between the two cores. This is half that of the cheaper Pentiums on test, while the Core 2 Duo E7300 sports six times as much. They also drew the same amount of power as the

Pentiums, so power efficiency isn't one of their strengths either.

If you're building a new system, don't plan on overclocking, and have a budget of around $150 or less for a processor, opting for the Athlon X2 4850e or AMD Athlon X2 5050e will provide much more bangs per buck. However, like the Pentium processors, the Celerons are stunning overclockers. By increasing the vcore of both processors to 1.536V, which is well within the tolerance of most HSFs, we were able to overclock the E1400 from 2GHz to 3.5GHz and the E1200 from 1.6GHz to 3.1GHz, which is an overclock of almost 100 per cent.

Clearly, if you're prepared to dabble in your PC's BIOS, the rewards are enormous. With the clock speeds close to doubled, the benchmark

scores saw massive improvements. The E1200's Media Benchmarks overall score increased from 490 to 833, eclipsing both the Athlon X2 4850e and AMD Athlon X2 5050e. It was a similar story in Cinebench, with the E1200's score increasing from 2,721 to 4,875. The E1400's Cinebench score rose from 3,341 to 5,467, which actually eclipsed the stock speed score of the much more expensive E7300. Crysis also saw a marked improvement, with the E1200's minimum frame rate of 11fps rising to 18fps, and the E1400's minimum frame rate of 13fps increasing to 22fps.

The Celeron E1200 and E1400 are mixed bags, but for those on a tight budget, though, even a basic knowledge of overclocking will yield significant rewards.

CPU	Packaging	Frequency	Core	Number of cores	HTT	Cache	Price
Celeron E1200	LGA775	1.6GHz	Allendale	2 x physical	200MHz	2 x L1 = 32KB, L2 = 512KB	79.00
Celeron E1400	LGA775	2GHz	Allendale	2 x physical	200MHz	2 x L1 = 32KB, L2 = 512KB	110.00

Intel Pentium E2000-series and E5000-series

Fast at stock speeds and incredible value when overclocked.

➕ Very overclockable; cheap

➖ The Athlon X2 4850e is better value at stock speeds than the cheaper Pentiums

atomic APPROVED
Pentium E5200

AMD CPUs have traditionally been more competitive at the budget end of the market, but Intel's Pentium E2000 and E5000-series provide some very stiff competition.

The three E2000-series models have 65nm Allendale cores, which consume a little more power at stock and overclocked speeds than the faster E5200, which sports a 45nm Wolfdale core similar to that found in fully fledged Core 2 Duo processors. The E5200 also has 2MB of L2 cache as opposed to 1MB in the cheaper Pentiums.

The amount of Level 2 cache has a significant impact on performance across the board. The Celeron E1400 and Pentium E2180, for example, differ only in name and the amount of Level 2 cache, with the E1400 having 512KB and the E2180 having 1MB. They both feature the same 65nm Allendale core clocked at 2GHz, yet the E2180 was noticeably faster in practically every test.

With a faster clock speed and extra Level 2 cache, the E5200 was considerably faster than the cheaper Pentiums. It achieved a score of 824 in our Media Benchmarks, while its nearest rival, the E2200, could only manage 738. Cinebench told a similar story, with the E5200 enjoying a 745-point advantage over the E2200. In Crysis, the E5200 recorded a minimum frame rate of 22fps – 3fps faster than the E2200 could muster. Average frame rates exposed an even larger gap; the E5200 extended its lead to 5fps, with an average frame rate of 31fps compared to 26fps for the E2200.

We were able to coax the E5200 to a dizzy 3.75GHz, where its performance was nothing short of stellar for a $154 processor.

While the cheaper E2000-series Pentiums are undoubtedly superb value, especially if you overclock them, the E5200 costs only a little more, consumes less power, has twice the Level 2 cache and is more overclockable.

CPU	Packaging	Frequency	Core	Number of cores	FSB	Cache	Price
Pentium E2180	LGA775	2GHz	Allendale	2 x physical	200MHz	2 x L1 = 32KB, L2 = 1MB	$115.00
Pentium E2200	LGA775	2.2GHz	Allendale	2 x physical	200MHz	2 x L1 = 32KB, L2 = 1MB	$119.00
Pentium E2220	LGA775	2.4GHz	Allendale	2 x physical	200MHz	2 x L1 = 32KB, L2 = 1MB	$129.00
Pentium E5200	LGA775	2.5GHz	Wolfdale	2 x physical	200MHz	2 x L1 = 32KB, L2 = 2MB	$154.00

atomic hot award
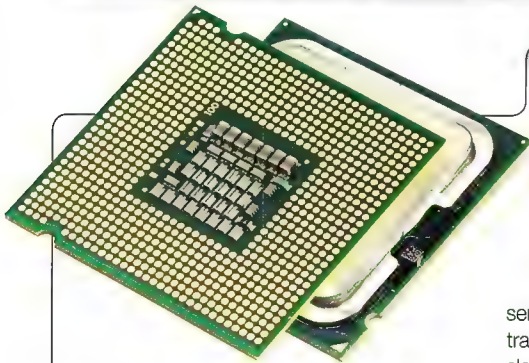
Intel Core 2 Duo E7300

A 4.2GHz-capable CPU for about $200? Oh yes...

➕ Great for gaming; incredibly overclockable; power-efficient

➖ The E5200 provides similar performance for less

While the Athlon X2 series hasn't aged particularly gracefully, the Core 2 Duo series has gone from strength to strength. After the welcome introduction of a 333MHz FSB in mid-2007, and then a die-shrink to 45nm and the Penryn core a few months later, you can now pick up a Core 2 Duo for about $200 – less, if you shop around.

The E7300 sits midway between the entry-level Pentium E2000 and E5000 series and the fully fledged Core 2 Duo E8000-series (not reviewed). It shares the same Penryn architecture as the E5000 and E8000 series, so it's made from energy-efficient 45nm transistors. As such, despite having two cores clocked at 2.66GHz, it consumed less electricity than any other CPU in this Labs test. Each core has two tiny 32KB Level 1 caches plus access to a shared pool of 3MB of Level 2 cache. This is a hefty 50 per cent increase in Level 2 cache over the E5000-series processors, but only half that of the E8000-series.

Despite only running 166MHz faster than the E5200, the E7300 is significantly faster in applications and games, thanks to its extra helping of Level 2 cache. For example, it returned a smooth minimum frame rate of 27fps in Crysis – a generous 5fps faster than the E5200. Like all Core 2 Duos, the E7300 is a super overclocker – our sample would happily run at 4.2GHz with a 420MHz FSB. This is an amazing achievement for a $200 CPU, and as you'd expect, it pushed the E7300 to the top of every benchmark graph bar WPrime, in which the overclocked Phenom X3 8750 Black Edition sneaked past by less than 400 milliseconds.

If you're a hardcore gamer, or are trying to build a high-performance PC on a tight budget, then the Core 2 Duo E7300 is as close to CPU nirvana as you can get. It runs cool, consumes very little power, is very fast out of the box and is incredibly overclockable. Those with less money to spend are advised to seek out the equally impressive Pentium E5200, but if you can afford it, the E7300 is unbeatable.

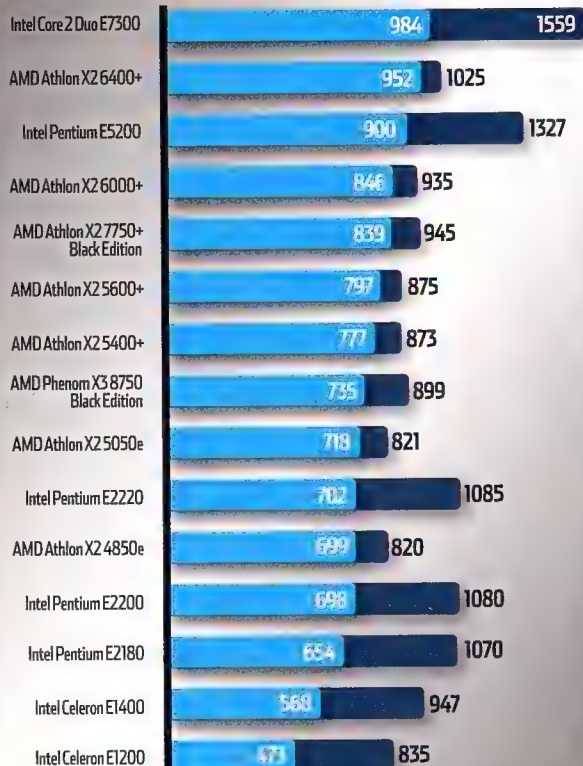| CPU	Packaging	Frequency	Core	Number of cores	FSB	Cache	Price
Core 2 Duo E7300	LGA775	2.66GHz	Wolfdale	2 x physical	266MHz	2 x L1 = 32KB, L2 = 3MB	$215.00

The Results

Standard ■ Overclocked

GIMP image editing

CPU	Standard	Overclocked
Intel Core 2 Duo E7300	984	1559
AMD Athlon X2 6400+	952	1025
Intel Pentium E5200	900	1327
AMD Athlon X2 6000+	846	935
AMD Athlon X2 7750+ Black Edition	839	945
AMD Athlon X2 5600+	797	875
AMD Athlon X2 5400+	777	873
AMD Phenom X3 8750 Black Edition	735	899
AMD Athlon X2 5050e	718	821
Intel Pentium E2220	702	1085
AMD Athlon X2 4850e	699	820
Intel Pentium E2200	698	1080
Intel Pentium E2180	654	1070
Intel Celeron E1400	568	947
Intel Celeron E1200	471	835

Handbrake H.254 video encoding

CPU	Standard	Overclocked
AMD Phenom X3 8750 Black Edition	1015	1210
AMD Athlon X2 6400+	998	1066
Intel Core 2 Duo E7300	989	1620
AMD Athlon X2 7750+ Black Edition	957	1071
Intel Pentium E5200	956	1430
AMD Athlon X2 6000+	951	1044
Intel Pentium E2220	912	1268
AMD Athlon X2 5600+	895	980
AMD Athlon X2 5400+	877	979
Intel Pentium E2200	819	1230
AMD Athlon X2 5050e	817	878
AMD Athlon X2 4850e	785	876
Intel Pentium E2180	759	1225
Intel Celeron E1400	721	1199
Intel Celeron E1200	599	1064

Multitasking

CPU	Standard	Overclocked
Intel Core 2 Duo E7300	728	1120
AMD Athlon X2 6400+	725	782
AMD Athlon X2 7750+ Black Edition	694	765
AMD Phenom X3 8750 Black Edition	690	739
Intel Pentium E5200	619	868
AMD Athlon X2 6000+	606	669
AMD Athlon X2 5600+	578	620
AMD Athlon X2 5400+	561	653
AMD Athlon X2 5050e	544	642
Intel Pentium E2220	541	730
AMD Athlon X2 4850e	536	630
Intel Pentium E2180	519	695
Intel Pentium E2200	514	727
Intel Celeron E1400	543	724
Intel Celeron E1200	400	599

Overall (avg Multimedia results)

CPU	Standard	Overclocked
Intel Core 2 Duo E7300	900	1433
AMD Athlon X2 6400+	892	958
AMD Athlon X2 7750+ Black Edition	830	927
Intel Pentium E5200	824	1208
AMD Phenom X3 8750 Black Edition	813	949
AMD Athlon X2 6000+	801	882
AMD Athlon X2 5600+	757	825
AMD Athlon X2 5400+	738	835
Intel Pentium E2220	738	1028
AMD Athlon X2 5050e	693	780
Intel Pentium E2200	677	1025
AMD Athlon X2 4850e	673	775
Intel Pentium E2180	644	997
Intel Celeron E1400	581	957
Intel Celeron E1200	490	833

atomic

■ Standard ■ Overclocked

Cinebench R10

CPU	Standard	Overclocked
AMD Phenom X3 8750 Black Edition	5854	7040
AMD Athlon X2 6400+	5294	5706
Intel Core 2 Duo E7300	5279	8690
Intel Pentium E5200	5081	7666
AMD Athlon X2 6000+	4838	5229
AMD Athlon X2 7750+ Black Edition	4595	5276
AMD Athlon X2 5600+	4523	4961
AMD Athlon X2 5400+	4445	4836
Intel Pentium E2220	4336	6280
AMD Athlon X2 5050e	4111	4682
Intel Pentium E2200	3971	6247
AMD Athlon X2 4850e	3942	4630
Intel Pentium E2180	3623	6242
Intel Celeron E1400	3341	5467
Intel Celeron E1200	2771	4875

Total system power consumption

CPU	Standard	Overclocked
AMD Phenom X3 8750 Black Edition	197	259
AMD Athlon X2 6400+	196	236
AMD Athlon X2 7750+ Black Edition	184	234
AMD Athlon X2 6000+	170	195
AMD Athlon X2 5600+	165	181
AMD Athlon X2 5400+	161	176
Intel Pentium E2220	145	216
AMD Athlon X2 5050e	141	158
AMD Athlon X2 4850e	137	154
Intel Celeron E1400	137	214
Intel Pentium E2180	137	198
Intel Pentium E2200	137	214
Intel Celeron E1200	131	198
Intel Pentium E5200	130	178
Intel Core 2 Duo E7300	127	208

WPrime (lower is better)

CPU	Standard	Overclocked
AMD Athlon X2 4850e	32.401	27.189
AMD Athlon X2 5050e	31.294	26.235
AMD Athlon X2 5400+	29.078	26.036
AMD Athlon X2 5600+	28.658	25.725
AMD Athlon X2 6000+	26.533	23.465
AMD Athlon X2 6400+	27.413	25.413
AMD Athlon X2 7750+ Black Edition	27.968	25.176
AMD Phenom X3 8750 Black Edition	20.933	17.922
Intel Celeron E1200	51.390	26.659
Intel Celeron E1400	41.139	23.671
Intel Core 2 Duo E7300	30.271	18.308
Intel Pentium E2180	41.328	23.671
Intel Pentium E2200	37.362	23.593
Intel Pentium E2220	34.166	23.159
Intel Pentium E5200	31.733	20.687

Crysis 1280x1024 2xAA

■ Min
■ Avg
■ O/C min
■ O/C avg

| CPU	Min	Avg	O/C min	O/C avg
AMD Athlon X2 4850e	17	23	18	28
AMD Athlon X2 5050e	18	23	19	28
AMD Athlon X2 5400+	19	26	22	29
AMD Athlon X2 5600+	19	26	22	30
AMD Athlon X2 6000+	22	27	24	32
AMD Athlon X2 6400+	24	33	27	35
AMD Athlon X2 7750+ Black Edition	22	31	23	34
AMD Phenom X3 8750 Black Edition	22	28	24	32
Intel Celeron E1200	16		18	28
Intel Celeron E1400	13	17	22	31
Intel Core 2 Duo E7300	27	35	36	45
Intel Pentium E2180	16	23	27	37
Intel Pentium E2200	17	24	27	35
Intel Pentium E2220	16	23	27	37
Intel Pentium E5200	24		35	45

KITLOG

There's nothing sexier than new kit. And whether you need to hoarde your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of Atomic recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in Atomic, so if you want to learn more, look up the issue and page number listed.

BUDGET

CPU
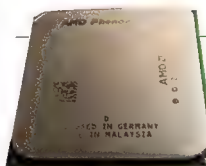
AMD Phenom X4 9550
PRICE $200

A well performing Quad core for those on a budget, that won't break the bank and doesn't get too hot.

MOTHERBOARD

ECS A790GXM-A
PRICE $200

Nothing says cool like a black mobo, and this one will satisfy your overclocking needs too.
Reviewed in Issue 99 – Page ??
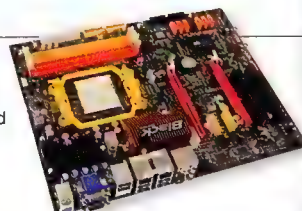
MEMORY
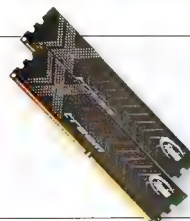
TEAM Xtreem Dark PC2-6400 C4
PRICE $60

These modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.
Reviewed in Issue 80 – Page 56

VIDEOCARD

GeForce 9800GT 512MB
PRICE $170

A 55nm card that remains very cool and fast, with plenty of headroom for overclocking and a price that speaks volumes about it's value. Great performance too.
Reviewed in Issue 92 – Page 49
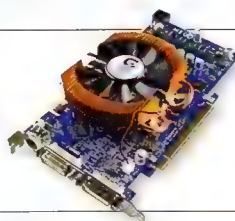
COOLER
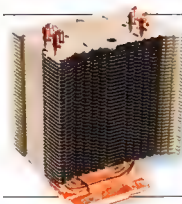
Noctua NH-U9B
PRICE $72

Labs tested to be the top of the cooling game without breaking the bank (or making you sweat – haha)
Reviewed in Issue 89 – Page 36

SYSTEMDRIVE

640GB HDD
PRICE $110

The absolute best value for money, with two 320GB platters giving great speed and low latency.
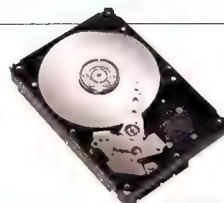
DISPLAY

AOC 2216Vw
PRICE $240

A great 22" widescreen for any purpose, with accurate colour reproduction and a bloody good price.
Reviewed in Issue 94 – Page 42

SPEAKERS

Steelsound 5Hv2
PRICE $120

Great gaming headphones with inbuilt mic, but music quality falls short.
Reviewed in Issue 73 – Page 43

CASE

Cooler Master CM690
PRICE $100

A sturdy, spacious case with plenty of airflow and more than enough room for the biggest of systems. Some stores even have a windowed version!
Reviewed in Issue 84 – Page 51

PERFORMANCE

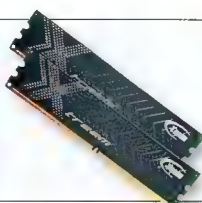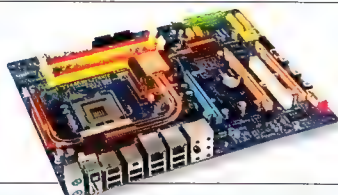### Intel Core 2 Duo E8400
PRICE $270

A processing powerhouse, now affordable and overclockable like buggery.

GIGABYTE EP45-DS4P
PRICE $200

A P45-based mobo with a bevy of features and a good overclocking potential.
Reviewed in Issue 93 – Page 55

TEAM Xtreem Dark PC2-6400 C4
PRICE $60

Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.
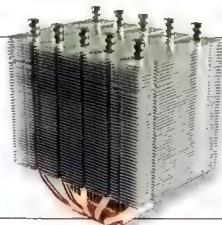*Reviewed in Issue 80 – Page 56*

Sapphire HD4870
PRICE $350

One of the best price to performance cards on the market. Welcome back Red!
Reviewed in Issue 92 – Page 36

Scythe Mugen 2 **[NEW]**
PRICE $84

The Mugen 2 performs almost as well as the TRUE, but has a fan included and is even a little cheaper!
Reviewed in Issue 100 – Page 42

640GB HDD - Times two!
PRICE $110x2

All the speed of dense platters, with the peace of mind to be able to back up your precious files.
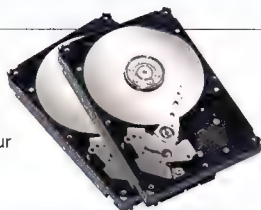
LG W2252TQ
PRICE $270

You'll pay a little more for this 22" screen, but the colours are amazing, with no backlight bleed and no ghosting.
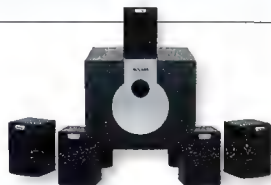*Reviewed in Issue 94*

AVLabs AVL325
PRICE $210

Slightly aged speakers now, but these still offer a great 5.1 sound experience - if you can find a set.
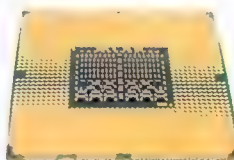*Reviewed in Issue 64 – Page 50*

Cooler Master HAF 932
PRICE $230

A massive case with three 230mm fans that can move enough air to qualify as a small aeroplane. And quiet to boot.
Reviewed in Issue 93 – Page 48

EXTREME

Intel Core i7 i965
PRICE: $1750

Intel's latest and greatest chip, complete with an unlocked multi, 45nm process, and a massive pricetag. Good for what ails you.
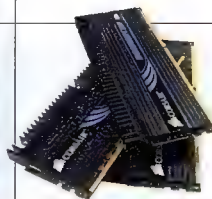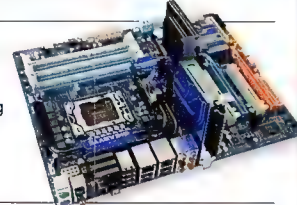*Reviewed in Issue 95 – Page 38*

GIGABYTE EX58-EXTREME
PRICE $520

GIGABYTE has had the best overclocking board thus far, and therefore the perfect mobo for a beastly rig.
Reviewed in Issue 96 – Page 38

Corsair Dominator TR3X6G1600C8D
PRICE $515

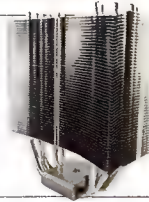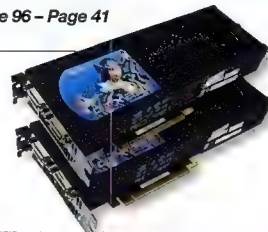Nothing says memory bandwidth like a triple channel kit of speedy, yet imposing RAM - a whole 6GB of it!
Reviewed in Issue 96 – Page 41

NVIDIA GTX295x2
PRICE $830 x2

NVIDIA catapulted themselves back to the top with this dual-GPU sandwich. Grab two of them in SLI for four-way madness!
Reviewed in Issue 98 - page 41

Thermalright Ultra 120 Extreme
PRICE $85

The current best air cooling - just make sure you grab a LGA1366 mounting kit to use it!
Reviewed in Issue 89 – Page 33

Intel 80GB SSD
PRICE $760

Blindingly fast, effortlessly quick, and uttely silent. Grab a normal HDD for storage, but games and OS need to live here.
Reviewed in Issue 94 – Page 50

Dell 3008 WFP
PRICE $2299

It's enough to make a grown man weep and beg. Or, at least, that's what we'd do for one of these simply gorgeous displays.
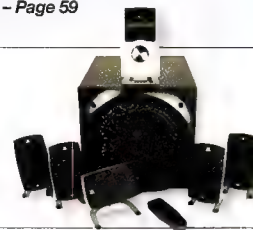*Reviewed in Issue 88 – Page 59*

Logitech Z-5500D
PRICE $419

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike.
Reviewed in Issue 48 – Page 56

Lian Li X-2000
PRICE $740

The only case we've had in that has made the editor orgasmically happy, and is drenched with quality in every one of it's brushed aluminium panels. Definitely a case to show off your system-building prowess!
Reviewed in Issue 91 – Page 54

Alternate history

Daniel Rutter takes us through what could have been...

When 3dfx made the original Voodoo Graphics 3D accelerator, it was a few long steps ahead of anything their competitors could manage.

If 3dfx had never existed, though, we'd still have 3D graphics cards today. Almost-3D games like Doom and Duke Nukem 3D had already sold zillions of copies by the time Voodoo cards arrived, and there were many other graphics-card companies. PowerVR, Rendition, S3, Matrox, and the obviously-never-going-to-be-major-players Nvidia and ATI.

This is how technology often develops. If someone sees a demand, they're usually not the only one to see it.

The precise sequence in which people come up with inventions, though, can sometimes make a very big difference.

are moderately dangerous when your carriage is pulled by sure-footed animals. If you start trying to get a vehicle to go, stop and turn entirely through its wheels, the miserably low adhesion and durability of cartwheels puts serious limits on your steam carriage's performance, and safety.

Solid rubber tyres had existed for years, but they're scarcely better than steel-rimmed cartwheels for a vehicle with a built-in engine, as opposed to one that's pulled by animals.

A fellow called Robert William Thomson, however, invented a rather impractical pneumatic tyre in 1846. His tyre was a step in the right direction, but it took another 43 years before John Boyd Dunlop invented the thin-walled inflatable bicycle tyre that led to proper car tyres.

Vulcanization was essential to make rubber tough enough to be useful in tyres; Charles

In computing, there was a critical trains-or-trucks moment in 1981. That was the year when IBM made their original 'Personal Computer', and went completely against their nature by giving the new PC an 'open architecture'. Mere months later, Compaq made the first 'clone' PC. And the rest was history.

If IBM hadn't made this strangely charitable move, the PC platform simply wouldn't have existed. Perhaps that would have made some kind of Apple the global standard; perhaps Sony or Acorn or Commodore would have ended up dominating. Perhaps by now there'd still be five different popular platforms, so economies of scale didn't apply as much and a decent desktop computer would still cost $5,000.

Could be worse, though. You could be trying to get to a LAN party in a steam carriage.

Dan Rutter operates on coal and coffee.
dan@atomicmpc.com.au

Solid rubber tyres had existed for years, but they're scarcely better than steel-rimmed cartwheels for a vehicle with a built-in engine...

Take trains, for instance.

Trains have great advantages, but they don't like hills. Robert Louis Stephenson didn't think a locomotive would ever be able to pull a load up a grade steeper than 1 in 100, and, even modern trains still need pretty flat tracks.

Once the rails are built, a railway is a very economical way of moving stuff. But laying flat tracks across a wide country is a very, very serious undertaking.

Most of the ruinously expensive cuttings and tunnels and bridges could have been avoided, if someone had invented motorised road transport first: Trucks.

Exactly one invention made trucks, and automobiles, possible: The pneumatic tyre.

There were, you see, road-going 'steam carriages' very early in the history of the railway. But they ran on wooden cartwheels. Cartwheels

Goodyear invented that around 1840, though.

So someone could have come up with a quite effective pneumatic-tyred steam carriage in, say, 1850, when the USA only had a twentieth of the railways it actually sprouted by 1890. If this had happened, a lot of passengers and goods would have ended up being moved via steam-truck on cheap roads, rather than via iron-horse on expensive rails.

And if tyre-inventors had put their thinking caps on a few decades earlier still, the train may never have taken off at all. We'd doubtless still have trains today, but we probably wouldn't have as many railways, and the 19th century would have been very different.

As it was, by the time someone made a car that was steered with a wheel – but which still ran on bloody cartwheels – the world already had enough railways to reach to the moon.

GALAXY

FAST AND FURIOUS
NVIDIA® GEFORCE® GTX 295 GRAPHICS CARDS

The Galaxy NVIDIA® GeForce® GTX 295 is the most powerful dual chip graphics card on the planet for gaming and beyond. Experience the hottest games such as Far Cry 2, Mirror's Edge, and Call of Duty 5: World at War at mind blowing frame rates, or go beyond traditional 3D graphics with Graphics Plus™ and experience GPU-accelerated NVIDIA® PhysX™ gaming effects, Stereoscopic 3D, and lightning fast video and image processing.

Logan Booker

Another Atomic Editor looks back on his years at the helm.

I want to say that I found Atomic. Fact of the matter is - it found me.

Despite having been editor of this glorious technology bible for the better part of 2007, my beginnings are truly humble. I called the vicious streets of Campbelltown in south-west Sydney home for most of my life until, in 2002, I made the trek to the big smoke to work as a junior sub-editor on Atomic, PC Authority and a host of other magazines that Haymarket - then AJB - published at the time.

Life suddenly became interesting, as though someone had injected chilli-laced epinephrine directly into my eyeball. To go from subsisting on junk food, delivering pizzas and meandering through an IT Certificate at TAFE to working on a magazine I read religiously and admired was breathtaking.

Ben Mansill took me under his wing and helped me refine my skills as a writer, Bennett Ring fostered my appreciation for all things gaming, and John Gillooly found ways to cheerfully explain complex concepts without making me feel like an idiot. As we strived each month to produce the best darn PC enthusiast magazine to grace the universe, we grew from being workmates, to friends and finally family.

Four years later, I found myself at the helm. It was overwhelming, scintillating and, at times, a little frustrating, but I would not trade my experiences in the Captain's chair for anything.

But enough about me.

Atomic is a magazine forged as much from knowledge and passion as it is love. Those fortunate enough to have scribed their thoughts onto its blessed pages can appreciate the gooey feeling of awesomeness said act inspires. And not the gross kind of gooey - the super-funky, warm gooey one gets from eating a choc fudge sundae with extra choc fudge. But Atomic is even better than a sundae; each page is a guilt-free pleasure you can bite into, savour the flavour of and digest slowly, and then feel enriched because of it. I challenge you to find a dessert that can do that.

You won't find one. Trust me.

However, as we all know, Atomic is more than a magazine. It birthed a community that continues to thrive today, eight years after the publication's debut. It's a community that has seen each of us, at least once, through hard times - be it medical emergencies or first-date jitters - and I have no doubt it will continue to prosper in the years to come. In a lot of ways it has separated itself from the magazine and become an entity all its own, allowing Atomic to be appreciated like a gemstone; multiple facets, each one sparkling in its own, amazing way.

In my years at Atomic, I also had the chance to ride a wave of cutting-edge technology, a wave that tasted of multicoloured PCBs, massive heat sinks and pencil lead. If you've ever smelt euphoria mixed with ecstasy, then you might be able to understand just how aromatic this wave was.

I lived thought the rise of AMD over Intel and its dominance through the early 2000s, and the snowflake that became the snowball that exploded into an avalanche that is now the 3D hardware industry. I witnessed the death of 3dfx, the rise of Direct3D and the maturation of standards we take for granted like PCI-e, HyperTransport and 802.11g. I don't believe I'll ever experience such an intense bundle of fun, education and joy as I did in that five-year period.

I travelled to IDF in Taipei, Taiwan; came close to drowning in the psychedelic, cash fuelled-rush of the last great E3 in 2006, and glimpsed the first-ever press screening of Bethesda's Fallout 3. Grand moments tied to even grander memories that sit in my mind like trophies in a pool room.

Sometimes, I sit back and think about what my life would have been like without Atomic. Although I can't hammer out fate's alternative journey in exact detail, there is one fact I am certain of - it would have been 456 per cent less happy. How's that for a statistic?

I know I should be talking more about technology and Atomic, but honestly, everything I saw, lived and wrote for this magazine lives inside my psyche, and has shaped me as an individual. In essence, talking about my life is like talking about Atomic, so ingrained is the magazine, the staff and the community.

I like to think my story is a testament to what can be achieved with a little bit of willpower, eagerness and patience. Atomic proved to be my golden ticket, but don't be afraid to pump your foot full of enthusiasm and stick it into every single door you can find - the key word being "stick", not "kick". You might be surprised at the opportunities you discover...

Logan Booker now works for Melbourne game developer Tantalus Media.

THE HOT
100

atomic

100 (or so...) of coolest tech, games and the most of awesome of people, chosen by you, the readers. **David Hollingworth** runs down the best of the best.

Man, picking what topics to include in this list was tough.

We could have 100 games. 10 different types of hardware to get the ultimate list of components. But, ultimately, Atomic is more complex than that. We love our hardware, sure, but at the end of that day our passion for hardware feeds into our love of games and getting the best performance – the poll has to be a combination of the two.

But more than that, it's an ATOMIC poll – so it needs to celebrate the magazine, too, and the people who have made it what it is over the last 100 issues. And that's not just a matter of looking inward – we... I wanted to celebrate the readers and forum members that have helped us make it so far.

That's how this list came to be.

And bloody surprising at times it is too! If you'd asked me or anyone else in the team how any of the categories would fall out, I think we might have managed to get maybe two or three right. The winner of best graphics card manufacturer was certainly a surprise, and to be honest, so was the top action game. However, that's what makes this a really important list – it's not just one or two tech writers coming up with it, it's a whole mess of some of the most informed and hardcore PC and gaming enthusiasts in the country.

When they say a 'board's a good overclocker, or that one writer is worth listening to – they know their stuff. So read on!

Contents

Top 10 Action Games

A mix of modern combat and golden classics opens up our Atomic Top 100.

#10 Portal, Valve Corporation, 2008

This is a triumph... with just those four words anyone who has completed Portal will be instantly reminded of one of the greatest songs in gaming history. And it comes at the end of a damn fine game, too!

Portal was short, and part of a greater Orange Box package from Valve, but its impact can still be felt in the industry. Its clever mix physics-based puzzles, clean graphic design and wicked sense of humour was a breath of fresh air.
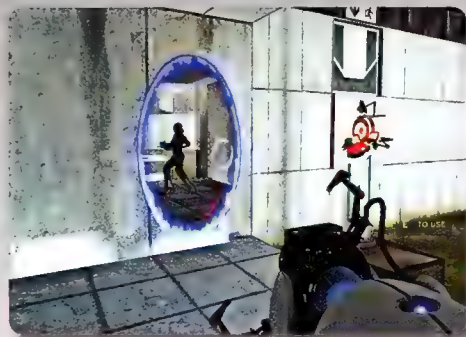
"Portal: A simple idea, yet so epic!" – **Brobbo**

#9 Mechwarrior 2, Activision, 1995
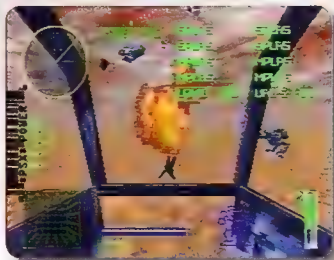
Ah, the simple joys of a 100 tonne mech knife fight.

Mechwarrior 2 managed to take all the best bits of the popular tabletop wargame and bring them to glorious, explodey 3D life. The mechanics of combat – from heat management to battle tactics – were all present, as well as extensive amount of mech customisation. Sure, there were flaws – and some nasty exploits for the less than chivalrous – but the game spawned two successful expansions and is still popular today.

"The ultimate blend of action with strategy. Environments that despite their simplistic appearance, will suck you right into the cockpit, and sounds that will be engrained in your brain forever." – **SquallStrife**

#8 Duke Nukem 3D, 3D Realms, 1996

It's embarrassing admission time – I, the editor of Atomic, first played Duke Nukem 3D on a Macintosh. And it frakking rocked.

Over the top humour is present in a lot of the games to make this list, but there's no game more over the top in the funny department than Duke. The wisecracks ("Shake it, baby."), the large environments, excellent equipment an even the cop pigs... this was a game that had attitude.

Now, all we need is Duke Nukem Forever to be half as good (and, you know, actually come out), we'll be happy.

"This is the game that started me off LANing; come get some." – **S. Medlock**

#7 Goldeneye, Rareware, 1997
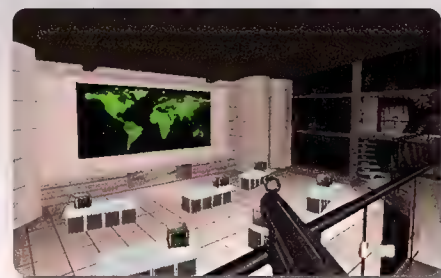
The Nintendo64 was a groundbreaking platform that hosted a mess of seriously well-received games, but few have had the lasting impact of Goldeneye007. When people say that Helo was the first real console shooter, you tell them they're wrong – this is the real deal.

Goldeneye was the game of the James Bond film of the same name, and was an FPS that had excellent weapon modelling, a measure of stealth-based gameplay and – for the day – awesome graphics.

#6 Grand Theft Auto IV, Rockstar Games, 2008

Many thought that GTAIII and its array of excellent expansions and semi-sequels was going to be hard to top – but Rockstar went ahead and did it anyway. GTAIV brings Liberty City alive in the most vibrant manner, from the hours of radio station banter and television channels, to a cast of great characters, and the most simulationist gameplay ever presented in a GTA game.

Brilliant.

#5 Half Life, Valve Corporation, 1998

Valve was relatively unknown when Half Life was unveiled back at the end of last century. Once the dust from the game's impact had settled however, the company has staked a place for itself as one of the great development houses. No doubt.

Half Life's blend of weird science, tactical gameplay, brilliantly coded graphics engine (that could run on nearly anything) and commitment to the modding community quite literally changed the way games were played and made. And, it's gotta be said... Gordon Freeman is the ultimate geek hero.

"At the time, nothing even came close to unifying excellent gameplay, stellar graphics, and an awesome storyline... Can't go past Half-Life." **– VannA**

#4 CounterStrike, Valve et al, 1999

"Its the game that Just. Wont. Die. And many people still refuse to admit that they cut their teeth in online fps with this classic."
Juggalo Scrub

And here's the game that, with Half Life, busted the game development business wide open.

Originally coded by fans Minh "Gooseman" Le and Jess "Cliffe" Cliff, this player-made mod simply took off, and has since become a commercial property in its own right, and launched the professional careers of more than one developer.

CounterStrike's excellent replayability and multiplayer balance is the heart of the game's success, and successive releases have added oodles to the game's look and feel. That said, there's a stilla strong pre-Source engine community playing the 1.6 release on the original Half Life engine.

#3 Doom, id Software, 1993

A flatmate of mine spent a whole night downloading the demo – over a 14.4 modem.

Those were the days.

Also, it was worth every agonising hour of waiting!

Doom looks pretty simple now, but when you consider the massive leap forward the game represented in gaming, from its use of colour and simple geometries to pioneering FPS multiplayer as we know it today, it has truly earned its place in this list.

"Wow. The sound of those Imps just around the corner still gives me goosebumps." **– Anon**

#2 Half Life 2, Valve Corporation, 2004

The compelling story starts right away in Half Life 2, and the action starts soon after. From there, it's a rollercoaster ride of incredible physics, superb graphics (and very scalable graphics, too) and masterful storytelling – everything that made Half Life a classic, Half Life 2 has in spades.

And with two expansions down, and a third coming (though who knows when!), it's a story that's still being told.

Combine that with the ongoing activity in the modding community around the Source engine, and Half Life 2 becomes a truly epic title.

#1 Call of Duty 4: Modern Warfare, Infinity Ward 2007

Call of Duty was pretty much synonymous with by the numbers WW2 shooters when CoD4 came out. When it was announced it was going to take the tried and true gameplay into a modern setting, there were doubts... doubts that were instantly dispelled in the first shattering gunfight in the excellently paced and plotted singleplayer campaign, and forgotten entirely by the time of your first foray into the fast, furious and varied online play.

This game has it all – superb ballistics and penetration modelling, groundbreaking customising features, awesome sound, detailed and engaging environments, and a rewarding system of advancement. Could anything be better?

Well, hopefully Modern Warfare 2... Regardless, congratulations CoD4 – you deserve this one.

"The perfect FPS. Plenty of heart stopping action with awesome graphics." **– walrus1967**

Top 10 Strategy Games

Games so great you'll be taking over the world in no time flat.

#10 Rome: Total War,
Creative Assembly, 2004

The Total War team had two hits under its belt when Rome was released – Shogun and Medieval – but Rome was something else again. Not only did it refine every element of the game, from combat mechanics to diplomacy and the manner in which the campaign unfolded, but it was also in glorious 3D.

It cannot be underestimated how... *awesome* this move was. Up until then your armies were represented by clever use of 2D sprites, but going 3D brought the battles between Romans and Barbarians (and, eventually, other Romans) truly alive.

#9 Warcraft 2, Blizzard Entertainment, 1995

Sure, the game looks so *very* dated these days, but there's still so much to love about this fantasy themed RTS. Naval units, hero units, and of course all that so very silly humor ("Are you still touching me?"), all wrapped up with an epic fantasy tale of war and devastation across the world of Azeroth and beyond.

Oh... and I hear there's a couple of spin-off games that aren't half-bad, either...
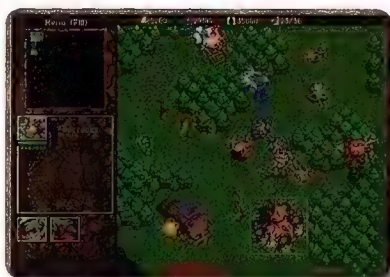
"Warcraft II is an epic game, seldom played anymore. Easy to learn, hard to master and entertaining when you're bored ("Stop that... You're making me seasick... BLEARGH!")." – **SirSquidness**

#8 Company of Heroes,
Relic Entertainment, 2006
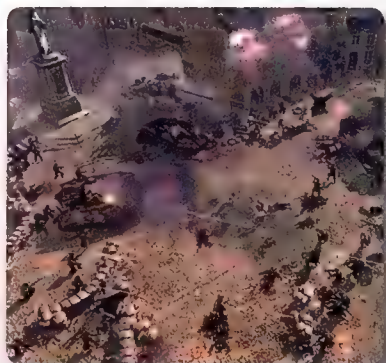
Not another bloody World War 2 RTS?!

That's what most reviewers and not a few players cried when Relic announced this as their follow up to the first Dawn of War. But boy... how wrong we were.

Amazingly, Relic took everything they learnt from DoW, applied it to a then worn-around-the-edges WW2 setting, and ramped up just about every aspect of gameplay. From the physics engine to the unit interactions, this was a game that surpassed all expectations. It looked great (there's a reason a lot of magazines like Atomic used it as a benchmark), played well, and showed developers that World War 2 was far from dead.

Which may not have been a good thing...

#7 Sim City,
Maxis, 1989

This is the game that put Will Wright on the map, long before he'd ever dreamt of Spore or the mindlessly babbling characters of his Sims franchise. Sim City had a simply objective – build a thriving city – but like chess that simplicity hid layers of complexity and an addictive one more turn quality that makes crack look like a harmless substance. But beyond the game itself, it was a remarkably educational title, and few games can match Sim City's number of awards in that respect.
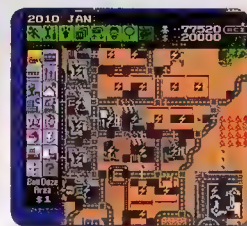
"Where else could we be Grand Masters of our own metropolis nurturing or deliberately destroying our own creations? Plus those reticulating splines got me going!" – **Virul**

#6 Supreme Commander,
Gas Powered Games, 2007

There are few things more satisfying than observing a game of SupCom from the maximum zoomed out height, and then slowly zooming all the way in, watching units change from bright icons to real machines, getting right up to a level of detail that looks as though you're in an FPS, rather than a strategy game.

Thankfully, one of the things more satisfying is using that view to manipulate your GIANT WALKING ROBOTS of DOOM as they tromp all over the enemy. This RTS seemed purpose-built to suck up hours of your waking life.

#5 Dawn of War, Relic Entertainment, 2004

It's easy to argue that Dawn of War 2 may well eclipse the original, but DoW deserves accolades for doing what many thought impossible – bringing the dark gothic world of Warhammer 40,000 to life. Relic did this by being bold – the developers didn't even try to recreate the rules of the tabletop game in PC form. Instead, they let the fluff – the stories – of the universe lead them to build their own game mechanics and systems.

What we got was the closest thing to actually being stuck on a blasted field of futuristic battle. And it was glorious. From stunning jump pack assaults to cunning dashes from Eldar infantry, DoW felt more like 40k than, well... even 40k itself! An incredible achievement.

> "Chaos pwns, nuff said."
> **Mandozza**

#4 Civilization, MicroProse, 1991

Poor old MicroProse might be gone and forgotten, but no one's forgotten the strategic majesty that gamers know quite simply as Civ.

Sim City might be addictive, but Sid Meier's Civ *defines* addiction. Anyone who's played a game will recognise the phrase "Just one more turn..." and the desperate need to guide your civilisation. Civ was near perfect when it was first released, and though have been some stumbles, every future release has gotten better – surely that's breaking some essential law of phsyics?

> "Must... find time... to sleep... and eat... just one more turn, then I'll do that stuff."

#3 Starcraft, Blizzard, 1998
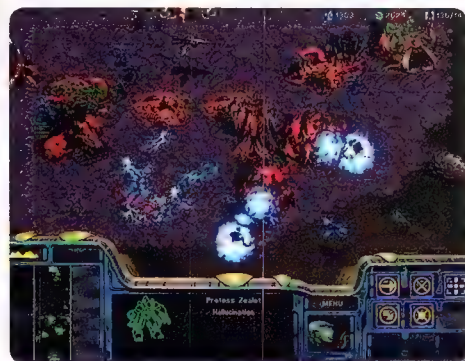
There's not a lot of games on this list that have a Cultural Impact heading in there Wikipedia entry. But that's Starcraft for you – it's practically a national sport in Korea, is still one of the most popular online RTS you can play, and gamers have spent LIVES playing it. It's just that good.

Many people claim it's the most important RTS ever made, and we're hard-pressed to say otherwise. Unlike you, the readers...

> "It's still being patched by Blizzard 11 years later. If that's not testament to its greatness, I don't know what is."
> **Craig Simms**

#2 Age of Empires, Ensemble Studios, 1997

I've got to admit – this one surprised me.

Age of Empires was originally released to some, to be honest, mixed reviews. In fact, there's a lot of flaws you can point out in Age of Empire's mix of Civ-like management and Warcraft-like tactical play – but for each flaw, there's also a mess of polish and clever gameplay elements to keep you hooked and playing.

Random maps, scenario builders and unique civilisations to choose from all contributed to this game having incredible longevity and appeal.

#1 Command and Conquer, Westwood Studios, 1995

Westwood kickstarted the entire RTS genre with the classic Dune II, but it took everything it learned from that game, polished and refined it, and then added a host of new features, to pretty much make what is now the gold standard of RTS titles – Command and Conquer.

From the tech tree, to the building interlocks, and the units under your command, every single facet of C&C just felt natural – like chess. And like chess there was tonnes of depth, some great humour, and of course this was just the first of many great games in the series. A worthy winner.

> "This was the game that introduced me (and many others) to the RTS Genre." – **Pred@or**

Top 10-ish RPG Games

Slightly over ten Role Playing Games keep us in a different world.

#10 Mass Effect, Bioware, 2007

RPGs are such a well-loved and – arguably – old genre that, for a new game to make this list is a pretty big achievement. But that's exactly what Mass Effect is – a *very* big achievement.

The game introduces us to Commander Shepard and his crew as they race against time to save the human race – and the galaxy – from a vast and ancient cosmic threat. It's space opera of the highest order. Combined with an innovative dialogue system, branching plot, great graphics and a moody score, it cements Bioware as one of the true masters of the modern RPG.

#9 Secret of Monkey Island, Lucasfilm Games, 1990

More graphic adventure than RPG, we still felt Monkey Island deserved a spot on the list for its excellent storytelling and writing – and you agree with us, it seems!

This tale of daring-do and piracy follows the wonderfully named Guybrush Threepwood as he tries to make his dream of becoming a pirate a reality. On the way he must learn the ropes of insult swordfighting, find treasure, and steal stuff – all piratey fun! Of course, there's also a nasty villain and a maiden to fall in love with. Classic stuff.

"Look behind you! A three-headed monkey!" – **N. Bennet**

#8 The Legend of Zelda: The Ocarina of Time, Nintendo EAD, 1998

You know, it really doesn't seem like ten years since this game was released. In part, it's because it just keeps showing up on lists like this!

And there's a good reason – it's damned good. Apart from the great story, music-based puzzles and – at the time – groundbreaking graphics, Ocarina introduced stunning technical achievements such as context-sensitive actions and locked on targeting. There's a reason GameTrailers.com called it a "Walking patent office"!

"God, if only I actually had FFVII... No but, OOT is the best RPG ever. It's currently the only one I actually go and replay. AND I own a N64." – **SkyHigh**

#7 World of Warcraft, Blizzard Entertainment, 2004

Eleven million paying subscribers and counting can't be wrong. 'Nuff said.

"With the second expansion, Blizz has given me even more reason to be addicted. The quality just keeps improving." – **S. Goldie**

#6 Neverwinter Nights, Bioware, 2002
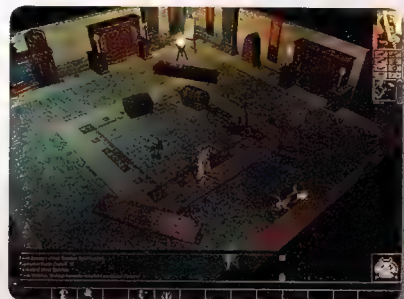
Did we mention that Bioware's good at this stuff?

I'm the first to admit – I'm a big DnD geek. But games based on the system always left me cold; even the admittedly brilliant Baldur's Gate (also Bioware) never quite seemed to capture that 'rolling dice' feel. Then came along NWN…

It looked great, had some fantastic characters to pick from to be your companion, excellent environments, as well as probably the most faithful adaptation of the DnD rules at that time.
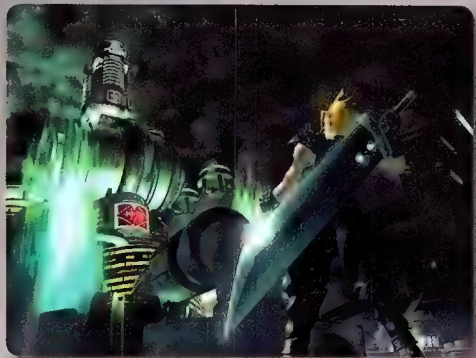
#5 Final Fantasy VII, Square, 1997

I've never been a fan of the Final Fantasy series, but here's what my girlfriend had to say when I told her this made it on.

"Damn right it's in the top ten – why isn't it number one! Hmm… Sephiroth…"

It's true, few sets of characters have drawn the love and devotion of those written for FFVII – from the martial artist Tifa Lockheart to the undead Vincent, they are all broadly drawn but wonderfully characterised. And then there's that battle music…

*"First game out of the Final Fantasy series that I played, nothing else after that could quite match what this game had." – **houseboat***

#4 Baldur's Gate, Bioware, 1998

More Dungeons and Dragons goodness, and more groundbreaking Bioware design.

Here the rules are classic Advanced D&D, and the setting is again the Forgotten Realms. The Baldur's Gate story, though, is more concerned with plot and dialogue than NWN's, and features a vast open world to explore, and torturous conspiracy to unravel, but be careful, as the game's opening quote hints…

"He who fights with monsters should look to it that he himself does not become a monster... when you gaze long into the abyss the abyss also gazes into you..."

DnD and Nietzsche – together at last.
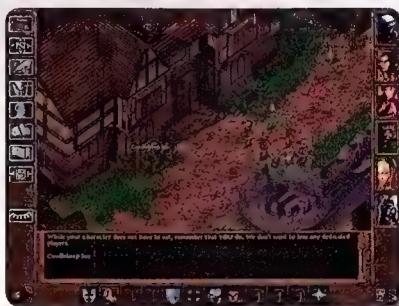
*"Spent more time on this and the sequel then most games I own combined. Bring on DragonAge." – **Anon***

#3
Knights of the Old Republic/ Elder Scrolls IV: Oblivion,
Bioware/Bethesda, 2003/2006

Two great games, two different takes on the RPG, and yet another feather in Bioware's RPG-hat.

There have been great Star Wars games, and then there's KOTOR. From the Dark/Light dichotomy of the game's moral system, to the writing and unique characters, KOTOR made an impressive hit on the whole genre.

Bethesda's Oblivion, on the other hand, eschewed the tightness of plot with a graphically rich open fantasy world that effectively leveled as you did – it ensured that there was always a hint of challenge behind every fight. Their love of the mod community has only made the game even better.

#2 Diablo, Blizzard North, 1997

Ah… point and click brilliance.

Diablo featured, like many great games, a deceptively easy interface, hiding layers of skill to unlock as you progress. The game also featured a deep fantasy backstory, presented the blueprint for the modern inventory management system, and introduced a skill-tree mechanism that is still seeing used today in games like World of Warcraft.

And it was fun – truly, one-more-level-before-I-sleep fun.

*"What other game developed the index finger to become the most leathal part of the body." – **Floda***

#1 Fallout 3, Bethesda, 2008

It could be argued that Fallout 3 has done so well because it's so fresh in people's minds.

But we say screw that! This game deserves top billing. Everything about this game is pretty much pure polish – the kitschy design of the future 50s-style wasteland, the weapons and armour you pick up, the dialogue trees and the many, many different ways to play the game add up to an RPG fan's Holy Grail.

A game that can, literally, be played again and again.

*"Radiation has never been so tingly in the pants." – **orcone***

Top 10 Game Developers

#10 Black Isle Studios

Black Isle is sadly no longer around, but in their time the developers created some magical games. The big ones are Fallout 1 and 2, the Icewind Dale RPGs, and they helped out a lot with the Baldur's Gate series.

But for many, Black Isle is remembered fondly for the innovative Planescape: Torment, arguably the most thought provoking and open RPG ever made – it didn't make our top ten, sadly, but for a lot of industry professionals – journos and developers alike – it's the crème de la crème of game design.

#9 Infinity Ward

This company has only been around for seven years, and has only sent three games to market. Not a great story for a top game developer, you might think, but when those games are Call of Duty, Call of Duty 2 and Call of Duty 4: Modern Warfare (you know, Atomic's NUMBER 1 action game of all time), well... that's some serious polish right there.

And now, though there's been no official announcement, IW is working on Modern Warfare 2, most likely hitting shelves the end of this year. With game number four have the same impact?

We think it will, and inside buzz is suggesting it's going re-write the FPS all over again.

#8 Rockstar Games

Rockstar's got a mess of great games under its belt. Bully, Red Dead Revolver, Smuggler's Run... oh, yeah, and some little series called Grand Theft Auto.

GTA came from humble top-down beginnings to become the flagship of its very own genre – the open world game. With each iteration Rockstar has pulled off a pretty impressive trick. The worlds keep getting more and more open, but the stories told within them keep getting more and more open. GTAIV was the natural highpoint of this – assuming there's going to be a five, who knows how crazy that'll be.

#7 Crytek/Nintendo

A company's got to be doing something right when it makes this list on the strength of two games and an expansion-cum-sequel. When those games are Far Cry and Crysis... yeah, that's worth voting for. Will any game look better than Crysis at hi-res? Not for a while.

And then there's Nintendo, which is kind of the opposite. A company that is, literally, more than a century old, that's been involved with every stage of video game hardware and software revolution. In fact, it's kind of hard to pin down its impact – it's simply too widespread!

But you know what I think? Nintendo gave us Donkey Kong, and a plucky Italian plumber. They're also the devs that helped Shigeru Miyamoto bring us Zelda!

#6 Bioware

Given how often Bioware games popped up in the RPG top ten, this is hardly a surprising development. We could wax lyrical, but we think that's all the testimony this groundbreaking developer needs.

#5 Bethesda Softworks

It's safe to say that Bethesda has made it to this list not on the strength of games like IHRA Drag Professional Racing 2005 and AMF Bowling 2004 – though, for a working game developer, we're sure those are important titles. No, it's likely off the back of the excellent and innovative work Bethesda has done on the Elder Scrolls series of games, and the company's outstanding take on Fallout 3 – a game we simply adored.

Bethesda seems to bring a fresh mindset to openworld games, along with innovative character mechanics, in depth storytelling, and commitment to ongoing quality.

#4 id software

Is there any more iconic a development house than id Software?

From the heady days of Commander Keen and Wolfenstein, all the way up to the frenetic pace (and cheating bots!) of Quake III Arena, id's games have helped define the FPS genre.

What's more, it's a company that hosts some of the smartest brains in the gaming industry – superstars like John Carmack (the only original founding member of the company left) and the now absent American McGee and of course the always controversial John Romero.

#3 Electronic Arts

EA is the true 800 pound gorilla in the mist of modern gaming. It's a company so huge that it owns many smaller development houses, as well as numerous EA-branded dev groups of its own, from EA Redwood Shores to EA Montreal. There's been some great new stuff out under the EA brand recently, most notably the spooky Deadspace, but where the company excels is in producing franchised games, such as the enormous EA Sports family of games.

Due to its prolific rate of production and reliance on licensed content, EA may not be the most-liked of developers or publishers, but you can't ignore the fact that, without them, gaming would be a much more boring hobby.

#2 Valve Corporation

It's not often a developer comes out swinging with a top game for its first effort, and even rarer for that first game to redefine the gaming playing field, but that's what Valve did with Half Life.

From then, Valve has rarely looked back, going from strength to strength not only in its titles (Half Life 2, Left 4 Dead et al), but also in its ability to work with the community at large. Without Valve's friendly and encouraging attitude to modders, we'd not have top titles like CounterStrike and Day of Defeat. Combine that with the Steam distribution model, and Valve has firmly earned its place in the list.

#1 Blizzard Entertainment

Blizzard is a firm believer in the quality over quantity mode of developing games. From Warcraft, Diablo, Starcraft and all the way up to World of Warcraft, Blizzard's titles are masterworks of polished design. After all, this is the company that has pretty much laid down the blueprints for MMOs, point-and-click adventure and real time strategy.

On top of that, Blizzard's games always have great stories, stellar writing, and some of the most visually stunning cinematics that you'll see. And, with new Starcraft and Diablo titles around the corner, you just know the best is yet to come.
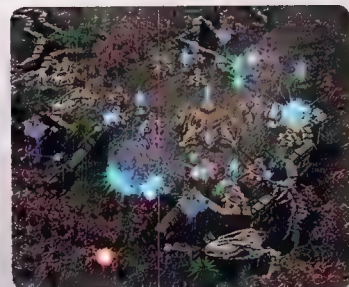
"You can't fault blizzard with the quality that they release." – rankor

Top 10 Motherboard manufacturers

#9 Asrock/Biostar/Elitegroup

The competition down this end of the market is fierce! So much so that there is no tenth slot.

Though not throwing the same weight as ASUS or Gigabyte, these boards nonetheless have some loyal fans, all pleased with the combination of price and features this mobo battlers have to offer.

#8 Foxconn

FOXCONN

The odd strange nautical misadventure aside (see issue XX), Foxconn has recently been producing solid boards with a veritable host of features and extras.

"Cheap, and decent." – **Anon**

#7 XFX

XFX SEE IT·HEAR IT·FEEL IT

XFX boards may make the odd mis-step, but by and large they're great choices, and are always striking in their design. A firm favourite of case modders, and with fantastic customer support to boot.

"Any issues, if they can't solve it in tech support, no questions just return to manufacture replacement, you can't beat that!" – **Shopi**

#6 Abit

abit

Abit has consistently released well-featured boards and offered excellent support – what more could an enthusiast want?

"Favourite board I ever had was an Abit NF7-S Rev 2.0. A mate had an IF7 before that and it was a dream." **jbat_64**

#5 MSI

MSI MICRO-STAR INTERNATIONAL innovation with style

This company's threatening the big boys with some very fine enthusiast offerings. MSI's X58 Platinum board was one of our favourites, and their tendency to add in handy LED screens and dials makes them one of the best.

"MSI make good quality boards plus they look after the overclockers. Features on MSI boards rock." **Glowstick**

#4 EVGA

EVGA

In all of the commentary on motherboard manufacturers the number one concern was solid after sales support, and this is something EVGA nails. Plus they make tough, well-specced, easily overclockable mobos. We gave their 790i Ultra board a Hot Award last year, and it still remains one of our favourites.

"Best quality motherboard manufacturer that actually care for their customers with their 24 hour support and the 90 day step-up program, they really do care for the enthusiast." **-adicolor93-**

#1 Gigabyte

GIGABYTE

The amount of votes that Gigabyte (and Asus, admittedly) received simply dwarfs the competition. For the serious enthusiasts – Atomic staff included! – there is simply no other board that matches for performance, reliability and support.
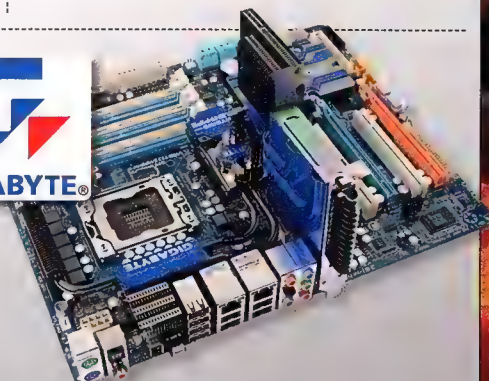
"Affordable, easy to install and trouble shoot with great online support and updates. Never had any problems, will never expect any." – **reb_dark**

#3 DFI

DFI www.dfi.com

This company has been a little quiet of late, but that's not stopped them earning a solid enthusiast-grade rep. Solid service again plays a huge roll, as do regular BIOS updates, lots of options and extras, and good overclockability.

"With Oskar Wu's help, DFI have become one of the great manufacturer's of motherboards. With updated BIOS's constantly being released to get the most of them." – **Virul**

#2 ASUS

ASUS Rock Solid · Heart Touching

What can we say about ASUS? Great gear, always well-built, and with consistent performance, earning a brand loyalty with overclockers and up-graders that many companies would kill for – not to mention some nice support, innovative extras and more LEDs than you can poke a stick at.

"Full of features, Asus always seems to be about bringing the options to the user." – **Griff**

Top 10 Graphics Cards manufacturers

#10 Gainward

Gainward snuck into the list on the strength of its Golden Sample series of cherry-picked and overclocked enthusiast-grade cards. They may not have the solid support of some of the bigger players, but in terms of speed, they make the grade.

"They're like the Rolls Royce of the graphics world." – **Mohawk**

#9 INNO3D

Performance is one thing, but it's also hard to argue with good old fashioned value – and that's the strength that got INNO3D into our rankings. Generous bundling of games, competitive pricing and excellent longevity is the key for this NVIDIA-exclusive manufacturer.

#8 MSI

innovation with style

This is another option based more on price than performance – who says the global financial crisis isn't hurting innocent geeks?
That said, while we would all like to have the fastest gear at our beck and call, the truth is that sometimes the hip pocket is more important than the frames per second. And that's what's earned MSI a very solid user base.

#7 HIS

We've not looked at a lot of HIS cards recently, but that's doesn't mean the company's dropped off the enthusiast radar. Good performance, excellent overclocking features and – most of all – solid cooling components are HIS' true strengths.

#6 EVGA

Service and warranty features ranked very heavily among the reasons why people voted for EVGA. On top of slick performance and solid factory overclocks, this is a great result for the smaller company. Bravo!

#5 Leadtek

Leadtek makes a lot of different gear, both in and out of the PC case, but that doesn't mean it doesn't put a lot of effort into making good video cards. As far as its fans are concerned, Leadtek also manages to hit the perfect price to performance sweetspot.

#4 Sapphire

There's a lot of passion about Sapphire cards amongst our readers. Whether it's because of performance, solid bundling (both in terms of "lots of stuff – cool!" and "not too much stuff – cool!"), and even the artwork adorning the cards, Sapphire is way out in front of – most of – the competition.

#3 ASUS

Rock Solid · Heart Touching

We love ASUS gear and it seems we're not alone. Interestingly, one of the talking points of ASUS' efforts in the video card arena is that, even though it cards may be more expensive, they are very much worth the money. Combined with great performance and after sales support that only a company this big can provide, it's a winning combination.

"Always build a top class graphics card and bundle extra goodies with it. A bit pricey compared to most vendors, but well worth it in the end. They also look awesome. – **mr_satay**

#2 Gigabyte

GIGABYTE TECHNOLOGY

Number one in motherboards, number two in graphics cards.
What'll they do next – start developing games?!
Regardless, Gigabyte deserves the accolades, for delivering reliable, well-specced gear coupled with generous bundles.

"I have so many of their cards that still work after years of abuse, again a brand that is very well built and hard to kill." – **dr_doom**

#1 XFX

XFX SEE IT·HEAR IT·FEEL IT

Ah, XFX – maker of very fine looking cards, with great bundles and good performance. The company has always threatened to walk away with a swathe of Hot Awards, but seems to just always fall short; but there is one area hard for reviewers to really quantify. Product-on-product reliability and quality. This is where XFX excels, and that's what many of our readers love about the company's kit.

A very well-earned win.

"Their products always seem to overclock well, they come with all the requisite parts, good bundles, the cards look the part (srsly) and their support, while taking a bit to get started up on is the best I've seen in regards to questions and RMAing." – **philo_sofa**

Top 10 Atomic articles

#10 DIY Racing Simulator
Ron Prouse, issue 88, 89 and 90

DIY Racing Simulator, Ron Prouse, issue 88, 89 and 90

Of all of Ron's many masterful builds, this was possibly the most epic.

Over three gloriously in-depth articles Ron built, from an old exercise bike no less, his own racing car cockpit, with fitted PS3, monitor, steering wheel, pedals and sound system. The end result was a super-sleek gaming setup that would make Fangio weep with jealousy.

Man, Ron has the luckiest kids in the universe.

#9 Input/Output
Dan Rutter, every issue

IO, giving some of the most informed and in depth answers in hardware and computing since Atomic first came to light. Dan's been one of the few constants in the history of this magazine, and deservedly so.

His ability to inform and entertain is unsurpassed. Go Dan!

"Always teaches you something."
K. Stankovich

#8 Big Willy
Dave Field, numerous issues

Dave Field created a monster last year, a monster made up of dozens of hard drives, metres of cabling, and his own blood, sweat and tears of joy. Big Willy was the testing rig he devised for two rounds of power supply testing, and anyone who saw it at last year's Atomic Live will remember the epic scale of his invention.

To say it made PSUs quake in terror is an understatement.

#7 Inside the Memristor
Ashton Mills, issue 91

Ashton combines a true love of science and computing with a masterful touch for taking complex stuff and laying it out for all to understand

and love in turn.

Above all his X-ray articles – and he's done a lot! – this one stands above the rest. And it's a doozy, explaining a fourth, heretofore 'missing link' of electronics theory. Oh yeah, that's how Ashton rolls.

#6 ZFS Project,
Jake Carrol, issues 96 and 97

This article cause quite a stir in the forums, and got a lot of people very excited about bring a touch of corporate grade storage into their home networks – exactly the kind of stuff Jake Carroll lives for.

This was a near-perfect Atomic article, that stretched readers as much as it informed them, pushing Atomicans to read up and learn the techniques that Jake was talking about so they could meet him halfway.

And make something very cool.

"Very cool and nerdy."
Technomancer

#5 Uber Linux Box Project
Ashton Mills, issues 20 to 23

What do you know – Ashton popping up again! This time with a classic article that goes back to the second year of Atomic's life.

Oddly enough, this is interesting timing. If you've read Ashton's TechO column this month, you'll know that he's finally saying goodbye to his sturdy old invention. Kinda sad, but also kinda cool, too – it served him with distinction, and opened up a lot of Atomican eyes.

#4 Ground Zero
Dan Rutter, every issue

Now Dan's just showing off!

But fair call, for a column that a lot of readers make their first port of call every time a new issue comes out.

#3 Free Speed, issue 1

Now here's a classic, dating back to when overclocking was frowned upon by Intel, and only the cowboy chip-maker AMD seemed to understand what it was about. This was Atomic's first overclocking article, and the most important ingredient needed to turn AMD's Duron processor into a mean beast was... a pencil.

Ah, the good old days, when you could clock a Duron 700 up to a massive 950MHz.

#2 Rise of the Machines
Chris Taylor, issues 97 and 98

Chris 'Atomic.edu' Taylor caught the attention of a lot of readers with his exhaustive look at Artificial Intelligence and the problems facing those researching it. Rather than talk about chips and locomotive systems, Chris focused on the nature of real intelligence, both human and animal, and why even the simplest decision we make is an order of complexity beyond what even the most complex machine can currently manage.

In depth and educational – Atomic at its best.

#1 KitLog, every issue

We thought long and hard about letting this into the count – after all, it's not really a traditional feature or article, or even anything that you can say needs to be written. KitLog is – after all – a compilation of our favourite gear.

But then... that is very important, and I must admit, we sometimes forget that fact. Atomic is built around its reviews, and KitLog is the most hallowed list of lists – the best of the best. More than one Atomican has built a gaming beast based upon the hardware we pick and choose for KitLog, and so for that reason alone, we think KitLog's earned its place at the head of this fine company.

"I have always purchased my kit from this listing and have not yet been sorry."
T. Salmon

Top 10 Atomic writers

#10 James Matson
(Sex in Games, In Game Cinematics, The Battle of the Drivers)

We open up the list of greatest Atomic writers with one of my personal favourites. James has the unique ability to turn his mighty pen (his pen truly is mighty – I've seen it) to almost any topic. From getting under the skin of the gaming industry to in depth testing of hand-coded bespoke drivers, he's your man.

Useless at a game of Rock Scissors Paper, though, but nobody's perfect.

#9 Chris Taylor
(Atomic.edu, Rise of the Machines, Who Are You?)

Helming our Atomic.edu section with style and aplomb, and firing in the odd Top Ten ranked feature story, Chris is relatively new to Atomic, but has made an impact with his straightforward features covering everything from annoying gaming trends and surveillance technologies to the complexity of creating Artificial Intelligence.

And I hear he's a pretty neat cook, too – maybe we can get him to do an Atomican Cooking Guide?

#8 Tim Dean
(ex-Technical Editor)

Personal story time. When I first got started in tech writing, one of the people who really guided my development was Tim – we were both on PC Authority at the time, working on reviews & labs and spending every lunchtime playing CounterStrike (the beta release – yeah, we're old), X-Wing vs TIE Fighter and Close Combat.

Ah, the good old days.

But, regardless, Atomic would not be the magazine it is today without his influence not only on myself, but also on every Atomic writer from those early days.

#7 Ben Mansill
(Founding Editor)

Ah, Ben – the man who started it all, and is a damn passionate writer to boot. Whether it's a game, a piece of hardware, or even an entire community, Ben's passion shines through in every word he writes.

#6 David Hollingworth (Editor)

Uh... whoa. Well, this is embarrassing!

"The right amount of geek with the right amount of cynicism." – pitty1

#5 Logan Booker
(ex-Editor, Fallout, Engine Room)

To say that Logan has a quirky sense of humour is like saying that LN2 is kinda cold. He's also cute as a button (according to more than one or two of the female Atomicans), an outstanding coder and a real pleasure to work with. Sadly, he's now moved on from journalism, instead living the Atomic dream by working at a games developer down Melbourne way.

And it couldn't have happened to a more deserving guy.

"I think there was one stage where every other page was his words. Quality stuff!" – Silhouette

#4 Josh Collins
(ex-Technical Writer, overclocker extraordinaire!)

There are few more skilled overclockers in Australia – and Josh is mates with them all!

Josh is, in so many ways, the perfect Atomican. His love of the nitty gritty of tech – from volt-modding to case-modding, gaming to forum culture – bled right through the page in every one of his articles.

#3 Justin Robinson
(Technical Writer)

He's been here less than a year, but Justin has already made a huge impression on the magazine and everyone he works with.

And not just 'cause he's so damned tall!

It's easy to throw around the word 'passion' here, and I have, but that's Justin. The only thing he loves more than taking apart a graphics card so he can apply his own thermal paste, is writing about it.

"His tech reviews cause gooey feeling inside plus intense jealousy . Can I have his job please?"
R. Dalziel

#2 Ashton Mills
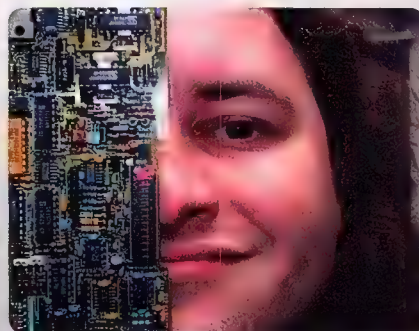### (ex-Editor, X-ray, Technica Obscura)

Ashton digs science, technology, computing and Linux – not necessarily in that order.

He also likes walks in the rain, pina colodas and romantic evenings in front of the fire.

But, more than all that combined, what really drives Ashton is the desire to inform and educate, which he does every month in his column and the X-ray section of the magazine.

"Hard to go past. Has the uncanny ability to knock high tech down into understandable form. Loves hardware so much, he rubs his crotch on it."
Craig Simms

#1 Dan Rutter
(IO, Ground Zero, Real World Hacking)

From the very start of Atomic to the very issue you are holding in your hands, Dan has brought his vast wealth of knowledge and love of everything techy and geeky to the masses. I could talk all day about what a great writer he is, but let's just put it this way – no other writer on this list came close to the votes Dan got.
Well bloody done, man!

"Good old Dan Rutter – the James May of atomic."
HSV_guy

Top 10 forum threads

#10 Robzy's jokes

(too numerous and dangerous to mention)

There are threads we love because they are moving, threads we go back to because they are hilarious.

Then there's Robzy's sense of humour, known far and wide as possibly the most confounding substance known to science.

#9 Comrade m4rx:

The official upgrade thread
(http://archive.atomicmpc.com.au/forums.asp?s=2&c=19&t=1515&p=0)

It started out as a simple insane rant, about one Atomican's epic PC upgrade.

It became a nearly 1500 post monster, constantly added to, discussed and now worshipped like some kind of green and black God.

#8 Got some H?

(http://forums.atomicmpc.com.au/index.php?showtopic=91)

Who says the members of our forum aren't creative? This is the offshoot of a classic thread on the old, now archived, forums. It focuses on one thing... haiku. Here's a sample:

Wanting Haiku cred
I rush this crap poem to
Post on the first page

Beautiful.

#7 Iron Chef Atomic

(http://archive.atomicmpc.com.au/forums.asp?s=1&c=1&t=86164, plus others)

More a tasty, tasty institution than a mere thread, Iron Chef Atomic has been inspiring would-chef's for many years now.

Sadly missing from the new forums, though... perhaps its time will come again?

"Who would have thought Atomicans were such culinary geniuses (especially with lentils)."
Timshel

#6 The Editor Needs a Makeover

(http://archive.atomicmpc.com.au/forums.asp?s=1&c=3&t=2771)

No he bloody does not!!!

"He does..."
colganaitor

#5 And What Are You Listening To?

(http://forums.atomicmpc.com.au/index.php?showtopic=141)

If there's one thing Atomicans like more than tech, it's music – whether that be the guitar-bowing antics of Sigur Ros, to howling deathmetal, it's all here in this very popular, and constantly updating thread.

"Longevity and participation."
mykl_c

#4 Atomic Nekkid

To say the Atomic community is a well-rounded, confident and outgoing bunch is a bit of understatement – thus this thread. It's, basically, exactly what it says on the tin – Atomicans, a tasteful lack of clothing, the approval of your peers.

"Brought the forums to their knees!"
Fredzfrog

#3 What's on Your Mind

(http://forums.atomicmpc.com.au/index.php?showtopic=2553)

12,000+ replies and an average of 73 posts per day – this is the most popular thread, at least in terms of usage, on the forums. It's a place to share thoughts, random happenings, and, well, anything that crosses your mind.

For a snapshot of the Atomican thought process, it's priceless.

"No matter what this is an all time favorite."
dany williams

#2 Jesus: Just a Man?

(http://archive.atomicmpc.com.au/forums.asp?s=1&c=24&t=35)

Another golden oldie from the archives, and further proof that our community is a diverse and complicated bunch. This thread – all 59 pages of it – ranges from in depth theosophical discussion to out and out flaming and back again. Some hated it, but for many this is one of the ultimate examples of the Atomic Forums in action.

"Back in the day, this was one of the most entertaining and thought provoking threads I'd ever seen."
hectorbustnuts

#1 The Green Slushy

You're all a bunch of sickos for voting for this one, you know this, right?

Atomicans come from all walks of life, and they like to share the highs and lows of their daily grinds. That's what forum regular, nodnerb, did with this... detailed account of one of the worst EMS callouts of his career. EVER. It's in the Classic Threads of the Archived Forums – search for it at your own risk.

"This thread had become in a way a pseudo right of initiation into the Atomic community, I remember my first reading of it... "
Lielthr

Top 10 Atomicans

#10

#7

#4

#9

#6

#3

#8

#5

#2

#1

YOUR
FACE
HERE

Here's a tough one.

I thought long and hard about coming up with this part of the poll. We all wanted to be able to celebrate the Atomic community, and find the best of the best to laud here in the magazine. If you've ever gone to an Atomic Meet, or to Atomic Live, or just hung out on the forums, you'll know that Atomicans – our community, our readers... our friends – are a great bunch.

But I did not want this to be some empty popularity contest. This had to have meaning – I wanted to be able to stand up at some point and say "These guys are the best!", and have their names received with nods of appreciation and friendly awe.

But, of course, it's never that simple. The simple fact of the matter is this – there is no one leading Atomican. Even

calling a top ten is next to impossible, and when we got the results back from the poll it was plain that if we couldn't do it, neither could Atomicans...

... because, and this is a true story, from the most voted to the least is only a matter of maybe three votes.

Now, one can argue that the poll fails because of a lack of statistical variation. But screw that – the poll is a resounding success, because all Atomicans rock.

So, whether you're a first time reader, or have been here and on the forums since issue one, this page is for you. More than a lot of magazines, Atomic simply would not be what it is today without such a wonderful community behind it.

Thanks for making the journey with us. It's been – and will continue to be, I'm sure – a blast. **DH**

An-atomic-ally

Ashton Mills gets all misty eyed about his Atomic past, while looking forward to the future.

I first met Ben at a PR do for Ocean software, which is showing our age. Naturally, it was at an aquarium. And in the goodie bags we got these long-sleeve t-shirts with 'Ocean' emblazoned on them – soon to became treasured, unique among the usual garb from events. Years later I would mention to Ben "Do you still have that long-sleeved Ocean shirt?" and he'd respond with an excitable and emphatic "Yes! How good were they!"

That's my first experience of Atomic, Ben's infectious enthusiasm, long before he'd started the magazine itself. But when Atomic came, it was Ben to a tee: his enthusiasm for tech and games made manifest.

As Editors we walk a fine line between readers, publishers, advertisers, and our own vision. When Ben asked if I'd like to take over, it was an enthusiastic "Yes!", but aside from just continuing the magazine, AJB wanted to expand Atomic to a more mainstream, less technical, audience. It was my job to make it happen, and I did. Looking back, while we accomplished a lot I think we lost a lot too.

But once Haymarket bought Atomic from AJB, we had free reign to return to the old ways and, in the process, do things like dropping the cover CD – most Atomicans didn't like it and it wasn't that useful for a geek audience always online. But publishers see things differently: cover CDs sell mags because, regardless of what we like to think of the buying public, everyone likes something for nothing. CDs don't cost nothing to make however, and the final argument for dropping the CD from Atomic wasn't improving the covers or retaining the culture: it was simply going to save the mag money, though I did bargain for extra pages to be thrown into the deal to expand the magazine.

Which brings me to some of the warm fuzzies. The last stand of the CDs was, for a change, to have a real purpose – for Issue 50 I wanted to do something that to date hadn't been done in publishing before: give away every issue, for free, on the cover. And so we did. In the process we employed Craig Simms, who spent an inordinate amount of time converting issues into a portable format and creating a kick-ass interface to boot. Ultimately, this was a resume for Craig, and down the track when we needed a new staff member, I got him onboard.

It's a sad fact, but when we went to build this the AJB library didn't actually have copies of the first 12 issues; *anywhere*. They were lost in time, like tears in the rain. Throwing out old issues isn't uncommon for some publishers, and it's always a travesty. We ended up scrounging among the staff for the early issues, including Ben's collection, and even then you may have noticed missing pages from the set that ended up on the discs.

Working with Bill, Logan, Nathan and Craig was the highlight of my time – I couldn't have asked for a better team. We had a blast working together, be it writing or pulling apart hardware or mooching with the PR bunnies at events, it was always fun.

Speaking of events, Atomic Live has a special place for me. What other tech mag could claim such a prize? And not that I want to shatter any illusions of it being borne from some sacred Atomic *essence*, but the idea was actually courtesy of our ad manager at the time, Macca, while the name kind of spoke for itself when I described it in a pitch as 'It's Atomic, only *live*!'. Because that's exactly what we wanted it to be. And it was. And it is.

Some other highlights – the re-design which Bill and I worked on for a month straight, and which would later mature. In the hands of Logan and now David, I don't think Atomic has ever looked so good, and it's heartening as an Editor to see some of the structures laid then still persist today.

The regular Bill's Review column which, as you probably guessed, while inspired by Bill and his eloquent diatribes consisting solely of swear words was actually written by Logan and his immaculate sense of humour.

And the time Craig showed off a spanky new hard drive for his array to me and which I jokingly 'blessed' by – and doesn't everyone do this? – rubbing it suggestively on my jeans. Years later Craig would tell me all the drives in his array had since died – except one. And you can guess which. True story.

Then there was the dancing on a bar in Taipei at Computex, as part of a dare with photos posted online, and something that took far more courage – the drinking of a bastard mutant cocktail of the combined energy drinks from a head to head roundup. Think mixing V with Red Bull and milk coffee and more. But what sort of fearless leader would I be if I showed fear? So I drank and it was an... interesting experience, but I promised the glowing green dwarf and his harem of pink bunnies I would never tell of what I saw, ever, lest the universe crumble and fall into a sandwich. Ah, those were the times!

I must wrap up, so there's just one more thing to say: Atomic is more than a magazine, it's a culture. And you're a part of it. It's been 100 issues of awesome, here's to the next :)

Ashton Mills is currently Editor of Computer Choice magazine.

TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

A fter a wonderful journey full of fans, drilling, polishing and more, Ron Prouse finishes up the last of his Case Modding 101 series.

This month he's just about finished his own epic mod – he lit the living daylights out of it last month, but now he takes the last step. Polishing the case interior to within an inch of its life!

This has been a great series, and we're very excited to be able to close it up in our 100th issue

Then, our edumaction specialist Chris Taylor gets his coding hat on, and goes through some of his favourite online resources for learning all about a mess of programming and markup languages. Whether you're studying these, or just curious to see what the coding bug is all about, it's a great starting point.

Finally, Zara Baxter gets fannish about transformative works. And Benny Hill. Really!

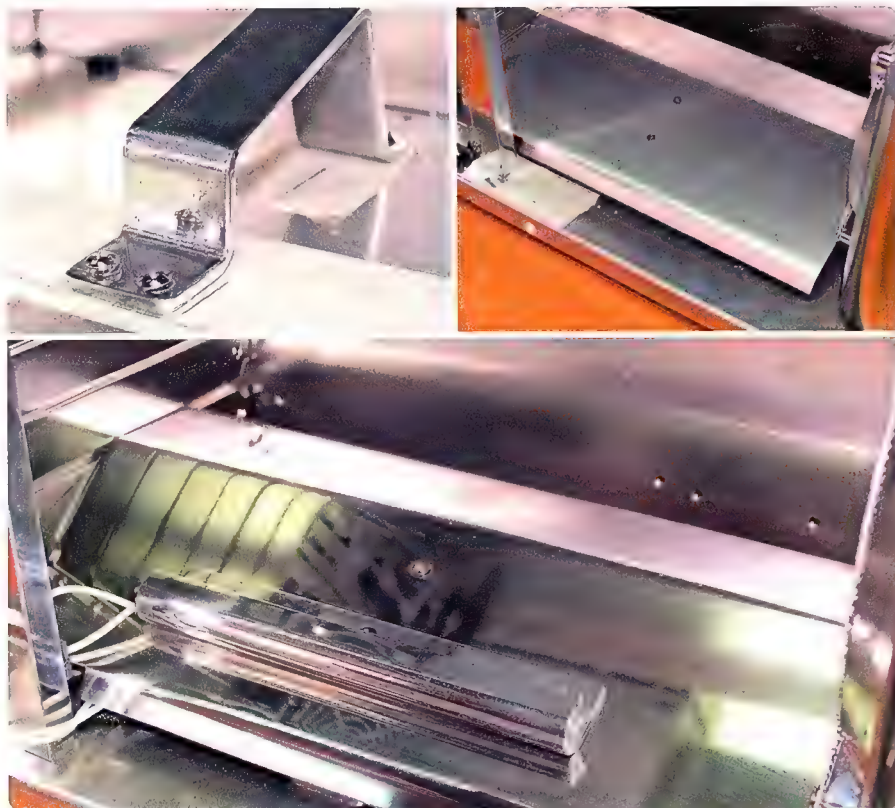84

88

DIFFICULTY
ADVANCED

Floors and Walls Tutorial 2009

Ron Prouse finishes off what he started.

The down-side of adding windows and lights to a computer case is that you can see what lies within! There's no argument, the average PC case is pretty ugly on the inside. Seriously, when you look at it objectively, there is nothing aesthetically appealing about a few drive cages suspended from the front, a power supply stuffed in the back, and a flat area to screw down a motherboard. Add in a heap of interconnects, power wires and fan leads, and the whole thing gets pretty messy. So, the trick is to minimalise all of the ugly stuff, and make a feature out of the rest.

Cable ties, split-loom and routing wires carefully will work up to a point, but there ultimately comes a time where it needs to be taken to the next level.

As the last part of our '101-series', we are going to look at some of the simpler ways to

Suppliers

PC Case Gear
www.pccasegear.com/
Ph 61 3 9544 7895
- 1 X Lian Li PC-A07 Case, $125.00

Local Supplies:
- 0.8mm thick aluminium sheet 60X 60cm, $25.00
- Aluminium strip, 25 X 3mm, Bunnings approx $10.00.

A false floor can be used to hide most of the wiring.

Metal origami is made easier if you have a plan of sorts.

Will this end up as a standard Lian Li feature?

hide a multitude of sins – by adding in some additional panels.

The first step is to add in a false floor, which is the easiest way to conceal nearly all of the wiring that you don't want to see. Previously we've stuck with a flat design, as this is all but invisible when the case is assembled, however a contoured floor adds some additional flair. In this instance the centre floor section will be secured by a single 25mm wide bracket, which was fabricated to give a rise of 20mm at the front increasing to 40mm at the back. The floor was then cut and folded to shape, with a 35mm wide flat section along the motherboard side, and rolled edges on both sides. The mounting bracket was drilled and tapped for the two 3mm screws that secure the floor in place. For maximum reflection of lighting effects, the floor was then polished, and a low-height 10cm red cathode mounted across the centre.
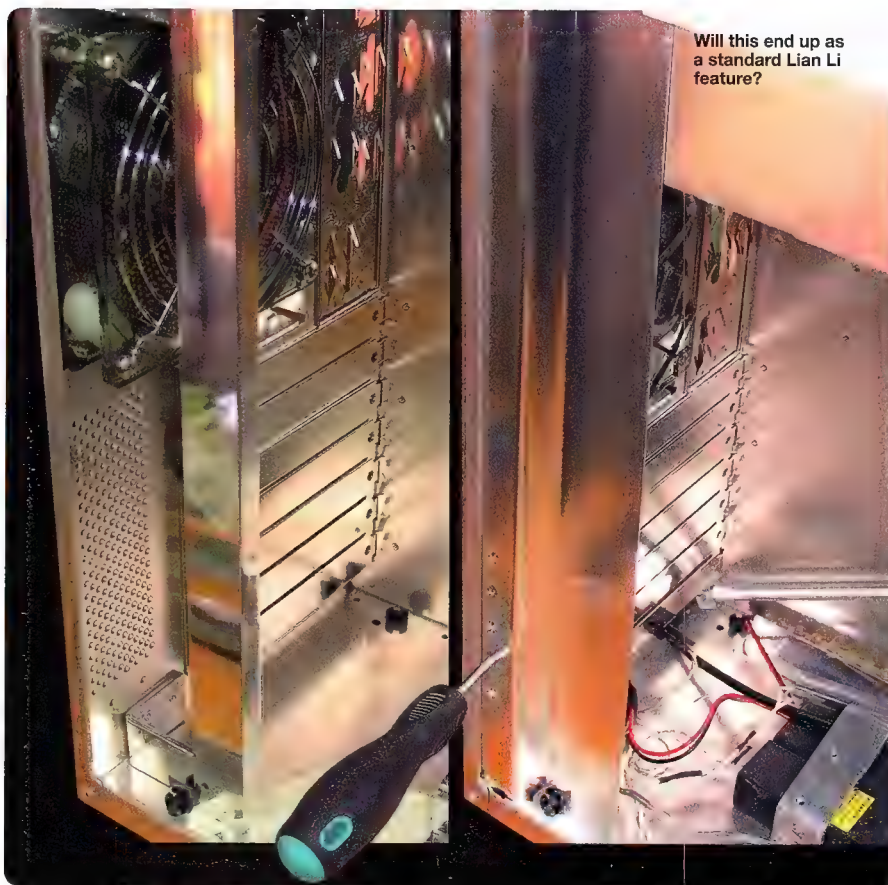
This will push light back toward the Mobo area.

The next step was the fabrication of the front floor section, which required us to make a cardboard template (to get all of the angles right) prior to cutting it out of 0.8mm sheet aluminium. This is good practise to get into, as there's not much room for 'winging it' when performing metal origami.

This panel will reflect additional light up toward the mirrored window panel that we introduced in the 'Windows 101 tutorial', as well as act as a mounting surface for another 10cm cathode. A blue cathode stacked just above the red in the lower level will give a unique effect across the Mobo area.

Once the panel was bent to shape, it was polished to a mirror shine, and then mounted to the floor with two 3mm screws. The CCFL, already mounted in a section of polished aluminium stock, was then mounted using two concealed 1/8in rivets from the under-side, and the wires passed out through a round notch cut in the left-hand side of the panel.

The next panel was a 'gusset', which filled in the gap between the cathode support post and the rear of the case. Although this is a simple piece of strip with two bends, it is important to point out that you need to make sure that it doesn't impact on the fitment of the side-cover. The sheet aluminium was bent so that it folded around the rear fan, butted up against the inner case and then covered the cathode support post. The lower section was trimmed so that it cleared the rear case-foot. We wanted to rivet the gusset in place, so the two OEM case rivets were drilled out, and the additional section re-riveted into place. The only problem with this was that it blocked access to the PCI bracket screws – the easy solution was to drill 5mm countersunk holes that lined up with the

Layer upon layer of polished aluminium – there must be a name for this sort of fixation
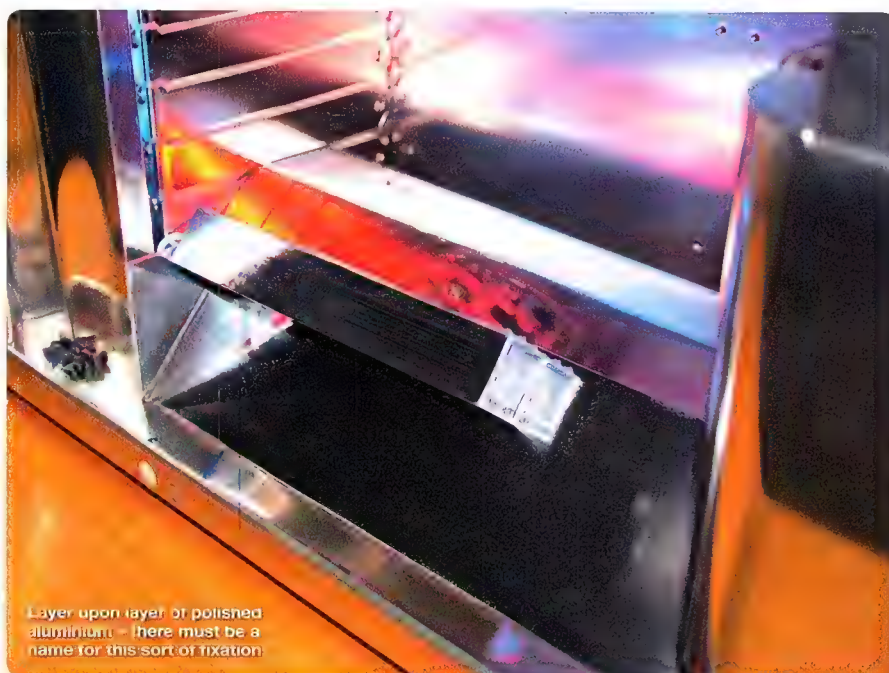
Mounting points for the inner-side cover were
fabricated from 10mm acrylic off-cuts.

PC cases and industrial machinery
are such a perfect fit.

screws, allowing a screwdriver to pass through
the panel.

The next panel was the inner-side cover, a
bulkhead panel that will cover all of the ugly
'Meccano' looking side rails that hold the 3.5in
and 5.25in drives in position. This required the
fabrication of some additional mounting points
… as well as packing out the panel so that it
lined up with the HDD cage modification that
we did in the 'Fitting Fans 101' tutorial a couple
of issues ago. After removing the case top, for
ease of access, two 10mm thick sections of
25mm wide acrylic were cut to length, sanded
and then fixed to the upper section of the case
using double sided tape and countersunk 3mm

screws. At this point the curved inner section
of the Lian Li case was cut to square with a
nibbler, so that the new panel would fit in at a
90° fold.

The inner-side cover was then measured
up, and a template created to ensure that all of
the dimensions fitted properly. The dimensions
were then transferred onto masking tape on a
0.8mm sheet of aluminium, and then cut out
with a fine-tooth jigsaw. The cut along the sec-
tion that was to be folded had to be perfectly
straight, so a cutting jig was used… put simply,

a length of L-shaped bar was G-clamped into
position so that it would act as a guide for the
jigsaw base to slide along. Whenever you are
cutting thin sheet metal, it is important to sup-
port both sides of the material to avoid bending
or warping along the length of the cut. The flat,
sliding jaws of a B&D Workmate are perfect for
this type of activity.

The Workmate also excels as a folding bench.
Using two sections of L-shaped aluminium bar
for jaws, and another to support the bending
action, will result in a crisp fold line. Once folded,
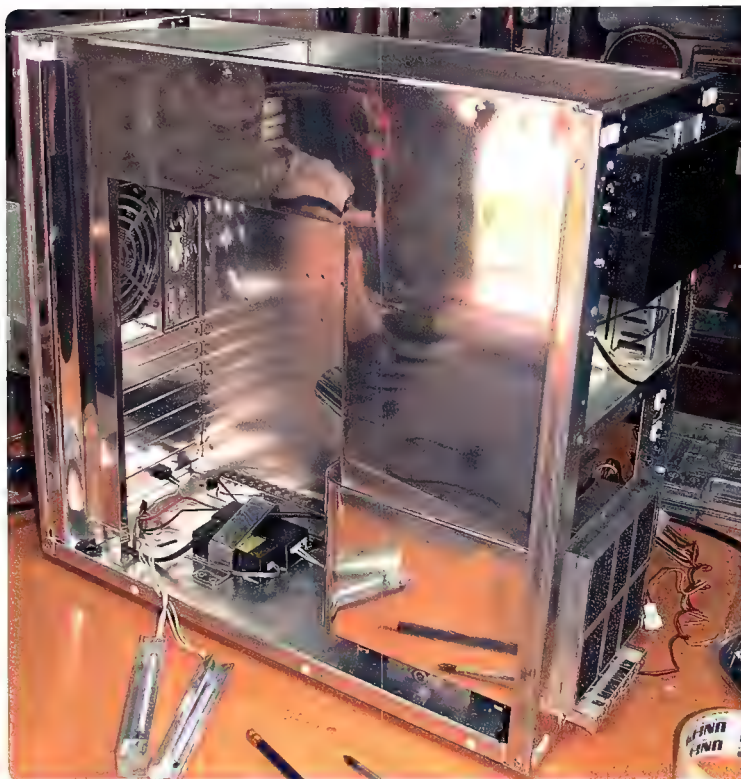
There has to be an easier way to photograph a mirror finish…
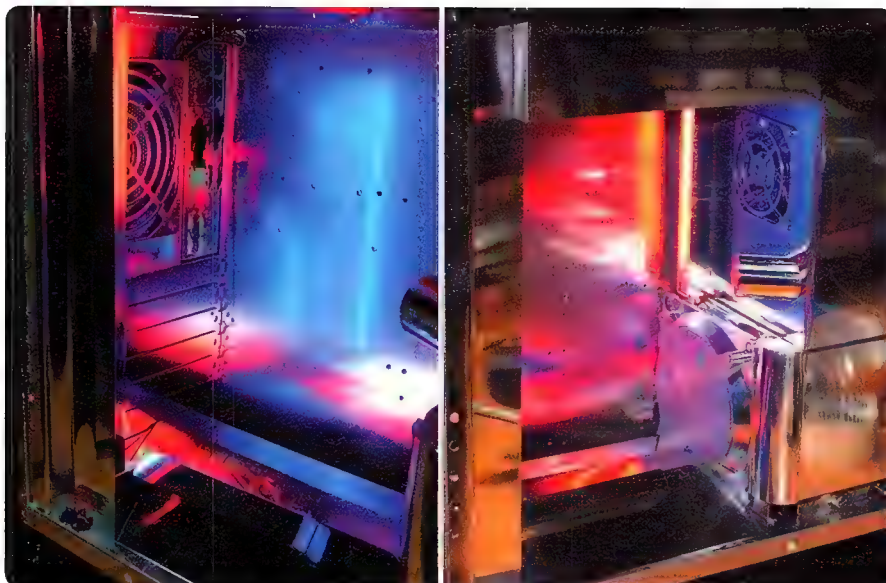
The case internals now have a beauty all of their own.

the panel was again checked for fit, and small adjustments made to get it 'right'.

The inner section was then cut to accept a blue LED 8cm fan, the LazerLED spotlight from the last tutorial, and a 20cm cathode in a polished aluminium sheath was riveted in place from the front. Note that the wires for the spotlight will be concealed as they pass through the panel, and that the inner edge has also been folded over to create a mounting point along the Mobo tray.

The next step was to polish the inner-side panel, which creates an issue of its own. Long sections of thin metal such as this are really hard to polish, as they flex like crazy… and if the buffing wheel 'grabs' an edge it will turn into a spinning set of blades that are guaranteed to remove fingers! The answer is to use a timber support under the metal, which will allow you to push the work-piece hard up against the buff and sandwich the aluminium securely in place while polishing. Buffing compounds are like sandpaper – they have varying grades of abrasion – so the best results will come if you work down from 'coarse' to 'fine'. The final shine can be achieved by hand, using a metal polish such as Brasso, and a soft cloth. A final, protective coating of car wax will help stop some of the oxidation that dulls off the shine.

The inner-side panel can now be assembled, tied back to the fillet panel at the rear of the case and attached to the lip of the mobo tray with 3mm screws. An L-bracket was fabricated and attached to the front of the HDD rack as a lower mount, and the top section screwed to the 10mm acrylic packing plates. Once assembled, the panel becomes a solid, integral part of the OEM sheet metal.

The floor section has plenty of space to conceal the CCFL inverters, which have been held in place with double sided tape and wedged inside the tapered bracket. The

associated wiring will be retained with hot glue during the final assembly. A PCI bracket on-off switch was 'Siamese-ed' to control both inverters, and the CCFL power leads routed between the panels so that they are all but invisible. OEM Lian Li fan guards were used as they suited the 'chunky' aluminium style of the case and, once polished, they also aid in reflecting light around the interior – especially the 12cm one at the rear. The wiring for the rear fan was passed out through a 12mm hole drilled through the very top, rear section of the mobo tray, next to the IO

panel. There is enough room under the HDD rack to pass SATA or rounded IDE cables to the motherboard under the false floor; similarly, the front panel wiring can also be concealed with minimum fuss.

With all of the lighting in place, there really isn't a wire to be seen – yes, that 15mm visible section of CCFL lead slipped through Quality Control, but it was retained later. The LED spotlight was positioned to illuminate the CPU water block/heat sink, so the full effect is not so obvious in an empty case.

The design concept was to create a case interior that looked stylish, even with the side-cover removed, concealed all of the wiring, and promoted better airflow. The aesthetics are personal, and I think we achieved the look we were seeking, and the wiring is definitely concealed. Regarding the last point, the two additional fans (80 and 120mm) provide greatly increased lateral airflow, especially in the vicinity of the graphics cards.

You might be thinking, "How does the motherboard fit in?" The easy answer is, through the top, although all of the panels we have added are simple to remove for service and upgrade.

With the side-cover in place, the lighting effect is also 'true to plan' – even though it is seen through the mirrored side cover, all of the components will be clearly visible unless the ambient light level is brighter than the internal case lighting. The polished aluminium gives off refracted/diffracted reflections, so that the effect changes depending on the viewing angle – an example of wave-particle duality and the uncertainty principle in action!

Or maybe they're just pretty lights. ⊕
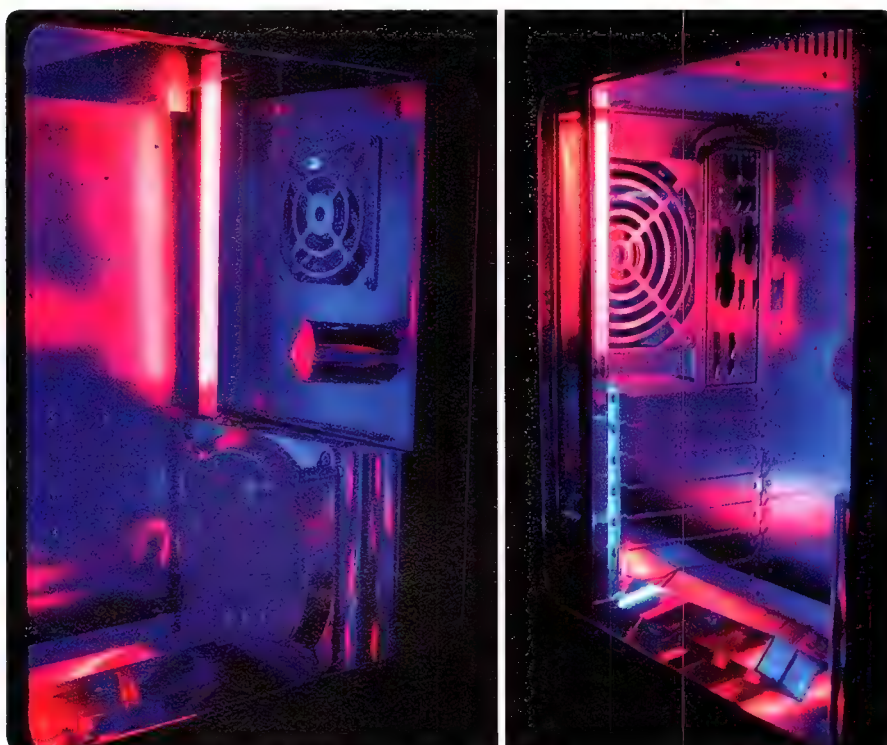
The finished project – praise be that it has an off switch!

Programming resources

Chris Taylor takes us through the wide world of support available on the web.

During my first year of the Bachelor of Network Computing, I had two units on object-oriented programming in Java. The lecturer – an excitable Buffy fanatic – and the textbook were the same for both units. Unfortunately, both the lecturer and the textbook were subpar.

Last month, I spoke about how in such situations, it's up to you to use your initiative to find a better book. Hit up the bookshop or the library and find a book that suits your learning style, a book that answers the questions that the assigned textbook doesn't. The 'recommended reading' section of your course outline booklet is probably a good place to start.

Good websites are just as invaluable as books for the information technology student. In some instances, the official site of a language is just brilliant. In other instances, knowledgeable members of the coding community have set up superior websites.

Java

Trail: Learning the Java Language
Web: java.sun.com/docs/books/tutorial/java/TOC.html
Sun Microsystems' Java 'trail' is brilliant. Back when I was studying Java, the tutor encouraged us to use this as our first port of call for solutions to all of our Java problems and misunderstandings.

The 'trail' starts, oddly enough, at the very beginning – it provides logical, coherent explanations of fundamental concepts like objects, classes, inheritances, interfaces and packages. It then moves on, explaining the mechanics of each of these concepts in a reasonable – but not great – level of detail. Easy-to-understand examples are provided.

Java Beans
Web: www.netbeans.org/kb/trails/java-se.html
Java Beans is another website I can recall my tutor making frequent reference to. It has a solid library of tutorials that, it should be noted, are relevant not only to Java programmers – there's some C++ and PHP stuff here too. Too, Java Beans provides the opportunity for members of the Java programming community to contribute content to the website. There is a reasonable collection of tutorials that have been uploaded by members of the community, most of which are quite specialist.

Java Lessons
Web: javalessons.com
Looking at this website, I wish I'd known about it back when I was actually working on in-class

tasks and assignments all those years ago. Java Lessons provides, yes, tutorials, but has a unique focus on examples. It teaches you the mechanics of the language and the purpose of each statement by providing you with a library of examples of varying complexity. Click on an example and it'll fire up the 'lesson viewer', which shows the source code in one window and an explanation for each line of code in another window. Move the cursor over a line of code and the viewer will highlight the relevant explanation. Visually, this website is ugly as all hell, but functionally it's great.

Java World Community
Web: www.javaworld.com/community
Java World's main page has some great articles that are probably most beneficial to those who already have a decent understanding of the language but want to expand their knowledge. Why we've included Java World in our list is its community section, which brings together the Java Q&A forum and some relevant blogs.

Java Coffee Break
Web: www.javacoffeebreak.com
I remember using this one during my university days. Java Coffee Break's library of tutorials is quite old – the author started his work back in 1996 – but is nonetheless very good if you're a newcomer to the language in search of tutorials that appeal to your learning style and specific needs.

C++

Visual C++ Developer Centre
Web: msdn.microsoft.com/en-us/visualc/default.aspx
The official website of C++ a logical and sound first port of all for solutions to any issues you may have with the language. The Microsoft Developer Network has a solid collection of useful downloads and tutorials that are just as extensive as a decent C++ programming textbook. This website is probably the best place to start if you're looking at learning the language in your own time or moving ahead of the class.

CProgramming.com
Web: www.cprogramming.com
CProgramming.com has an amazing library of tutorials for both C and C++, which progress logically from the very basics to complex topics such as OpenGL. The problem with CProgramming.com is that it's not updated very often. One look at the website's homepage, for instance, will show that prior to a couple of March 2009 updates, the most recent update was in November 2008. Before that? August. 2007. Note that a lot of CProgramming.com's content seems to come from authors other than the site's creator, meaning a lot of it is probably kicking around elsewhere. The fact that it's all in one place on CProgramming.com is why this website makes our cut.

alt.comp.lang.c-c++
Web: groups.google.com/group/comp.lang.
c++/topics?lnk

This is a very active Usenet group dedicated to the discussion of C++. With thousands of subscribers, there is no shortage of folks capable of answering even the hairiest of queries. Search through the many thousands of posts from as early as November 1986 and you're bound to unearth gold. If you're reasonably competent in C++, this group is still of great value, as discussing the language with like-minded individuals and answering the questions of less-skilled users well help your own learning and build your confidence with the language enormously.
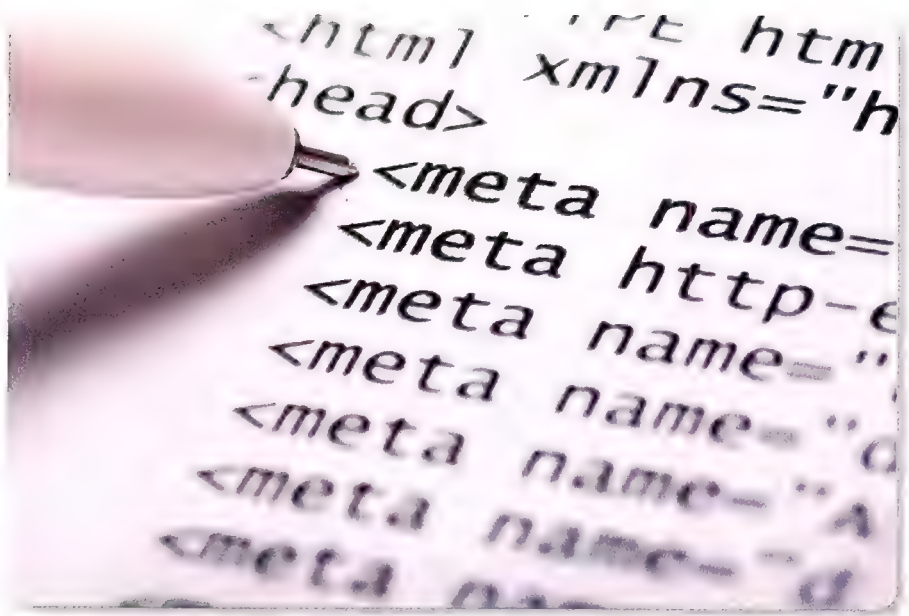
LearnCpp.com
Web: www.learncpp.com

A website with some very basic tutorials. Not particularly useful for those already quite confident with the language who are in the market for a website that'll take them that bit further, but definitely worth a look if you're a beginner or having difficultly grasping some of the fundamental concepts of the language.

CPlusPlus.com
Web: www.cplusplus.com

CPlusPlus.com has tutorials, of course, but the main selling points are its active forum and its collection of working examples, the source code of which can be downloaded, compiled and run in either DOS or Windows.

Visual Basic

Visual Basic Developer Centre
Web: msdn.microsoft.com/en-us/vbasic/default.aspx

Once again, Microsoft have put together a top notch website. The Microsoft Developer Network's Visual Basic website offers similar content to their C++ page – there are downloads and a large assortment of tutorials. Most interestingly, there is a selection of video tutorials available. Like the Microsoft Developer Networkís C++ page and Sun Microsystem's Java trail, the Visual Basic Developer Centre

orients clueless newbies by familiarising them with programming in general and then the basic concepts of the language and its syntax. For the total newcomer to programming, the Visual Basic Developer Centre's Absolute Beginner's Video Series is a most excellent resource.

Mark-up and scripting languages

W3Schools
Web: www.w3schools.com
W3Schools has a brilliant array of tutorials for the mark-up and scripting languages – most notably ASP, CSS, HTML, Javascript, PHP, SQL and XML. W3Schools' library of tutorials is very extensive. Have no fear that the desire for quantity has negatively impacted the quality of W3Schools' content, though. There are examples aplenty. You'd be hard-pressed to run into a problem – at least in one of the languages W3Schools focuses on – that wasn't covered on W3Schools. A great website for beginners and experienced developers alike.

PHPFreaks
Web: www.phpfreaks.com
Tutorials and a very active forum on PHP coding.

HTML: An Interactive Tutorial
Web: www.davesite.com/webstation/html/
A basic but good tutorial on getting started with HTML, which covers not just coding but the basics of website design.

YourHTMLSource/JavaScript
Web: www.yourhtmlsource.com/javascript
An accessible but nonetheless extensive introduction to JavaScript. The main part of the website, as the URL suggests, focuses on HTML.

JavaScript Kit
Web: www.javascriptkit.com/javatutors
This website is pretty old, as demonstrated by the tutorial that talks about the Y2K bug, but it has a large library of quality JavaScript tutorials. The focus of JavaScript Kit is on tutorials that cover more specialised, advanced topics, rather than generalised newbie stuff.

SQLzoo.net
Web: www.sqlzoo.net
SQLzoo.net provides an introduction to SQL. Provides interactive examples that aide the learning process significantly.
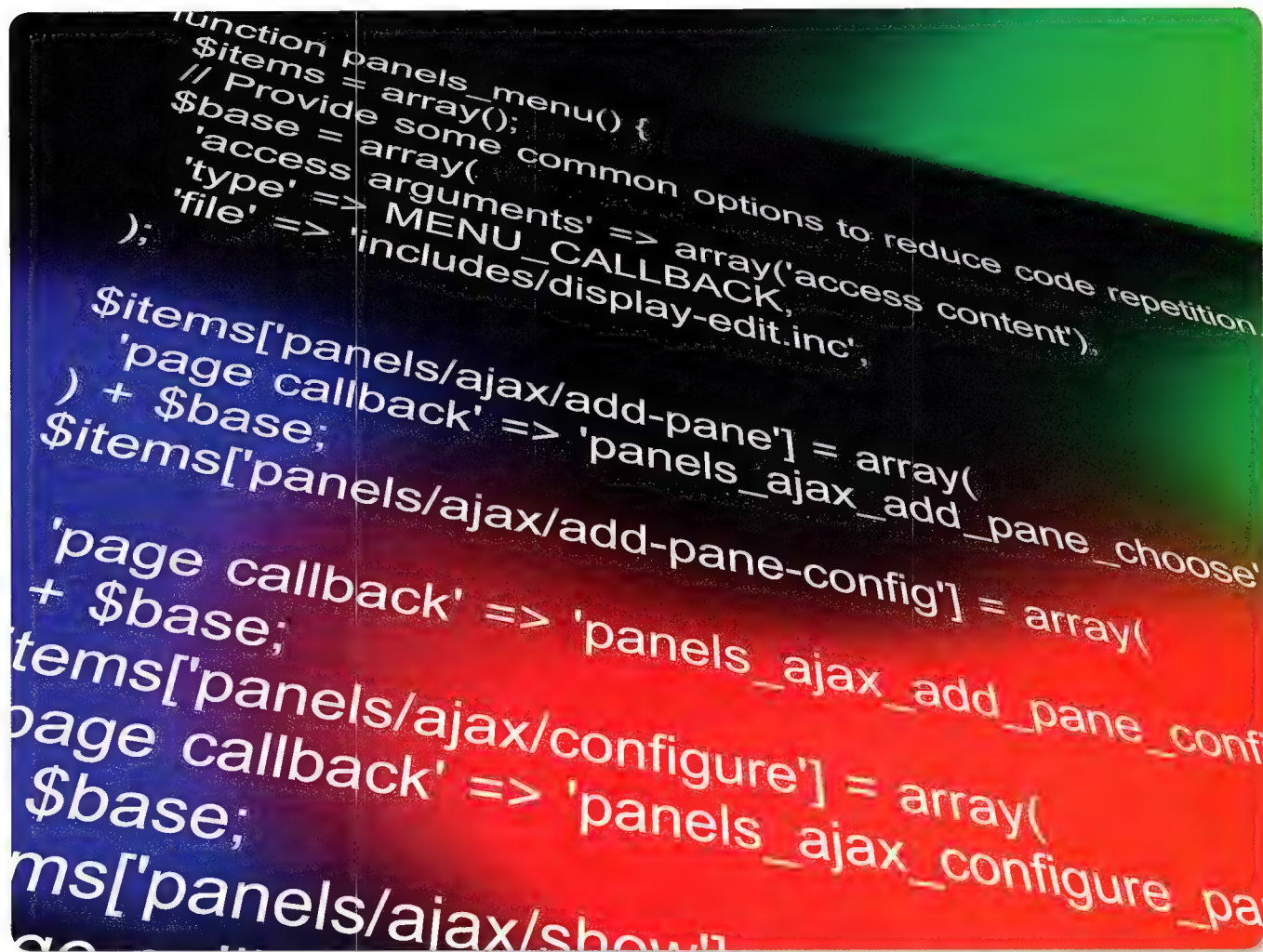
HTML.net
Web: www.html.net
Basic tutorials for HTML and CSS. Both sets of tutorials make no assumptions about prior knowledge and, as such, are absolutely basic. At the same time, they're nowhere near as extensive as W3Schools' collection of tutorials. Only suitable for those who are absolutely inexperienced.

The Python Tutorial
Web: docs.python.org/tutorial
A straightforward name for a very straightforward website. The Python Tutorial introduces you to, oddly enough, the Python language and then takes you from the basics to more advanced ideas. That said, this website is probably best for those with some programming experience under their belts.

Beginners, Non-Programmers Guide to Python
Web: wiki.python.org/moin/BeginnersGuide/NonProgrammers
A list of Python tutorials aimed at the complete newbie, including a couple aimed specifically at children.

```
function panels_menu() {
  $items = array();
  // Provide some common options to reduce code repetition
  $base = array(
    'access arguments' => array('access content'),
    'type' => MENU_CALLBACK,
    'file' => 'includes/display-edit.inc',
  );

  $items['panels/ajax/add-pane'] = array(
    'page callback' => 'panels_ajax_add_pane_choose'
  ) + $base;
  $items['panels/ajax/add-pane-config'] = array(
    'page callback' => 'panels_ajax_add_pane_conf
  + $base;
  items['panels/ajax/configure'] = array(
  page callback' => 'panels_ajax_configure_pa
  $base;
  ms['panels/ajax/show']
```

The power and the passion

If you create an awesome mashup, how do you prevent the big guys from taking it off the interwebs?

Before you read the rest of this column, I want you to watch a video. I'll forewarn you: it's a sequence from The Passion of the Christ, so it contains gore, violence and intense imagery. If that might affect you adversely, or you can't view it: never fear, I'll describe it beneath. However, for those of you champing at the bit, there's one more instruction: make sure you have computer sound on.

Ready? It's at h**ttp://www.poetv.com/video.php?vid=3698**

But whether it's theft or not may not be as clear cut as it might seem.

Once you've watched and listened, I have a question for you: did you laugh?

For those who didn't watch, the video shows Christ, with the cross on his shoulders, walking towards the site of the crucifixion. Parts are sped up, parts are repeated, and parts are reversed, all to make it fit with a particular piece of music called "Yakety Sax" by Boots Randolph.

A magic thing happens when you add Yakety Sax to pretty much anything on YouTube. It becomes laugh-out-loud funny. There are more examples at **http://coilhouse.net/2008/10/06/better-than-coffee-yakety-sax-mashups/**

You may also have seen the Jane Austen work, Pride and Prejudice, performed as Facebook updates (**http://www.much-ado.net/austenbook/**) or perhaps stumbled across a Dr Who mashup set to Coldplay's The Scientist (**http://cellfish.com/video/107940/Back-To-The-Start---Dr-Who-Music-Video**). Perhaps you've seen The Shining: Feelgood Movie of the Year (**http://www.youtube.com/watch?v=7jk0hOf8Wp8**).

What all these things have in common is that they're transformative works – they take an original creative work, and transform it by combining it with another, or putting it into a new medium, or reinterpreting it by placing events out of sequence, etc. Many transformative creations are done for love rather than money and are examples of fans reveling in 'their' culture.

Not everyone is happy about transformative works. When it comes to fanfiction set in fictional worlds, some authors see it as outright theft of their characters (and it's certainly copyright infringement). Others (as with Larry Niven's Known Space) embrace the fans who write stories around their material and take it in directions they may never have thought of. Most major studios and recording companies will pull any videos on YouTube and other major video sites that use their copyrighted material.

It's certainly the case that fans use copyrighted material in the production of fanfiction, vids and other artistic creations. But whether it's theft or not is not quite as clear cut as it might seem. Transformative works fit some definitions of Fair Use (US) or Fair Dealing (Australia) under copyright law.

Fans that create these kinds of work often band together to share vids, fiction, and other materials. It's been going on since at least the seventies, when Kirk/Spock Star Trek fiction proved immensely popular in underground fanzines. Sites such as Livejournal and Journalfen that allow 'friending' systems and friends-only posts have become a favourite spot for fans to gather. The ability to limit who views the work they create helps them to build communities of like-minded people. And it's by no means a small phenomenon. One Livejournal community, Deleterius, exists just to snark a very specific subset of fanfiction – Harry Potter 'Mary Sues'. Deleterius has had some 12,000 posts since it was opened in mid 2003.

Fans have always had a tense relationship with the copyright holders: regardless of how transformative their creations might be, one small person against a multinational conglomerate usually results in fan works being erased. As a result, fans often try to stay under the radar, and, not surprisingly, fan subcultures have developed sets of 'rules' that bind them together and help avoid copyright actions against them. .

But it's not the best solution to the kind of issues that fans may have to deal with (imagine how to even begin dealing with fictional underage sex in Harry Potter, from a legal perspective, and you have some idea…).

So, in 2007, a group of fans including Australian academic Cathy Cupitt, from the University of Western Australia, formed the Organisation for Transformative Works. Their main aims were to protect the works created by fans, providing legal advice and assistance as well as maintaining an archive of fannish works. The current chair of the board of directors is Naomi Novik, author of the best-selling Temeraire fantasy series. Not surprising, to anyone immersed in fan culture, is that all board members are women, coming from fields as diverse as academia and law to accountants and managers of non-profit organisations.

The Benny Hill/Passion mashup isn't on YouTube, btw: I bet you can guess why.

Zara Baxter is not a member of OTW, because she doesn't create fannish works; though she keeps meaning to join.
zbaxter@pcauthority.com.au
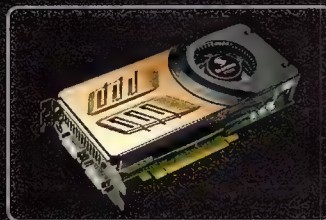
GAMEPLAY

GAMES, GAMING AND FILM COVERED... ATOMIC-STYLE

It's bit of a short section this month, but given how packed the rest of the mag is (and how mutch gaming content we threw at your last issue) we think it all balances out.

That said, we still have some very hot games on review.

Pitch Black is one of our favourite films of all time, and Assault on Dark Athena is the latest chapter in the ongoing Chronicles of Riddick. Not only is it the sequel to Escape From Butcher Bay, but it also includes a revamped version of that very game. Value!

We've also been hip deep in infected in Resident Evil 5, which is proving to be as visceral and entertaining as any game in the series.

And, since this is after all the epic 100th issue, we thought we'd look back at a little column that we published about a year after the magazine launched. Spookily, it's just as relevant now as it was then...

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GAMES ▷

R

Games can be violent. They are also not just for kids. John Gillooly wants to see an R rating, and this is why...

It was a very non-Alanis Morrissette type of irony the day it was announced that Grand Theft Auto 3 (GTA3) was to be pulled from shelves as it was also the day Judas Priest played in Sydney. For those who aren't up on the whole '80s metal scene (there must be one of you out there), good ol' Judas Priest was one of the original targets of music censorship groups, and had also been entangled in legal battles over whether its music was responsible for a suicide pact between two American teenagers who were allegedly influenced by back-masked messages saying 'do it' on one of its albums. Judas Priest eventually won the court case, but the whole debacle stands as one of the landmark moments in the ongoing media debate about violence in entertainment.

The game industry is about to reach the point that the music industry reached in the '80s. The pulling of Grand Theft Auto 3 from the shelves on 5 December, and the subsequent refusal of classification, was clouded in several layers of confusion. Initially, it was seen as a knee-jerk reaction to articles that appeared in Sydney and Melbourne newspapers, which were a rehash of the age-old violence and gaming arguments, but also contained some rather sane comments by Victorian Premier Steve Bracks, who was actively pushing for the belated introduction of an R rating for games. In the end, the pulling of GTA3 was ascribed to confusion during the process of application for rating with the Office of Film and Literature Classification (OFLC).

The argument for an R rating keeps popping up again and again, usually in concert with the release of games like Carmageddon, Postal and now Grand Theft Auto 3. As games get more and more realistic there is a need to keep the games that adults want to play available, but stop 'em from corrupting the kids, a plan that most people agree on.

We are very much at a crossroads in gaming. The increase in realism that comes from modern day processing power, graphical grunt and audio hardware means we are seeing more than ever before games that offer a greater freedom of choice.

GTA3 has an amazing scope. A big success in gaming is creating a believable, persistent fully 3D city. Whereas games like Midtown Madness, Driver and Carmageddon have achieved this to some degree, GTA 3 takes it a step further and allows you to run around, catch trains, steal and drive a host of cars, pretend to be a taxi, and yes, mug people and demonstrate a whole range of anarchic and violent activity.

It is not a game for children, but on the other hand it is a game that demonstrates nothing worse than what is seen in some R-rated movies like *Natural Born Killers*, and nowhere near the level of intensity of Category 2 Restricted books like Brett Easton Ellis' *American Psycho*. The actual issue that needs to be addressed is the outdated notion that games are for kids.

Games are for kids. They are also for everyone else. One thing that is abundantly clear, to me at least, is that you can never really tell if someone is a gamer or not based upon first impressions. If we look at the simplest part of the equation, most of the kids that were kids when the games are for kids arguments first evolved are no longer kids. That is one of the great joys of life, we (most of us anyway) grow up, mature and become better able to cope with more mature concepts. It is called becoming an adult.

I want to be able to play the games I want to play. The introduction of an R rating for games is becoming a necessity, not just because of an increase in violent games. That is not what we are seeing. GTA3 is nowhere near the pathetically mindless kill fest of Postal, but it allows the gamer to have a huge degree of control over how they behave, and some people will choose to push the envelope.

This is where gaming is headed. How on Earth can you classify a massive multiplayer RPG, or a game like Black and White, in which the central focus of the gameplay is freedom of choice? Let's face it, these games aren't immediately violent, but they can be. It all depends upon how people choose to play the games. For example, how does some sort of user created phenomena like player killing fit into the current classification paradigm?

An R rating for games seems to be the next logical step. Unfortunately, the review period for game classification by the OFLC is over and the ultimate changes are now in the hands of Parliament. The introduction of an R rating should theoretically satisfy those on both sides of the argument. It takes some of the currently MA rated games out of the hands of kids and into the hands of adults where they belong, and should hopefully mean that games like GTA3 can make it back onto the shelves and into the hands of people who should be mature enough to play them.
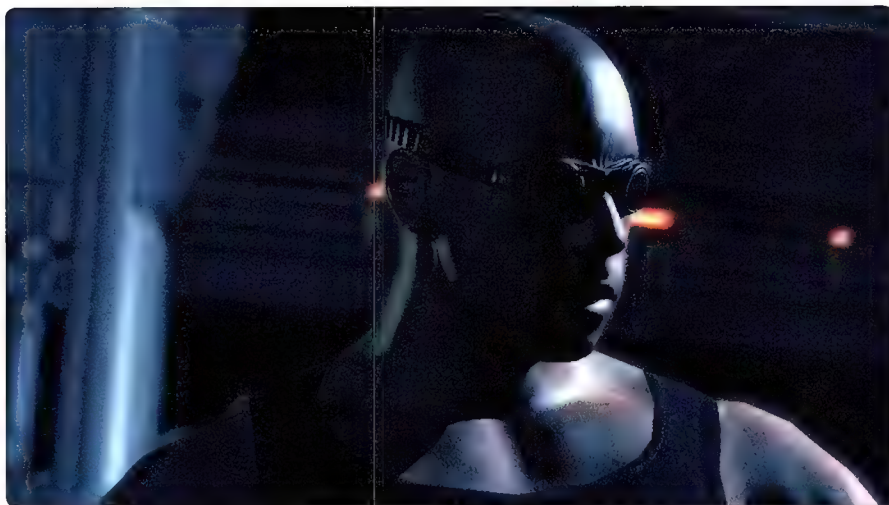
tCoR: Assault on Dark Athena

Riddick is back, with a brand new... no, wait, that's Vanilla Ice!

Vin Diesel is renowned for being a big lovable geek at heart, with a penchant for Dungeons and Dragons and computer games. Riddick, his character from the Chronicles of Riddick films, is a sociopath with a knife fetish and innate night vision thanks to some clever shivving and trading during his last prison stretch.

Put the two together, and you get some pretty damn good video games. Not perfect mind you, but we'll get to that.

In fact, it seems pretty churlish to look such a gift horse as Dark Athena in the mouth and cry shenanigans. Not only do you get the latest chapter in everyone's favourite serial killing protagonist, but you also get a re-mixed Escape From Butcher Bay, the first Riddick game. It's a bold move, but very clever – Butcher Bay was a critical success, but not nearly enough people played it the first time around.

Both games are essentially stealth action shooters, played from a very visceral first person. Diesel provides all the Riddick voice talent, and was even heavily involved in the second game's production – he loves this character, and it shines through with every grim declaration and brutal killing move.


Assuming you leap straight into Dark Athena rather than Butcher Bay, the game starts with you adrift in space, alongside Johns (a familiar character to anyone who's seen the first film). You're both in suspended animation (or as suspended as Riddick gets) when the vessel is harpooned by a monstrously large merc ship, and hauled aboard. From here, it's a matter of stealthily moving about the ship, bartering knowledge with prisoners, avoiding detection, and, when necessary, cutting up people like so many sides of beef.

The combat is both the game's strength and its greatest weakness. In a one on one fight, the game shines – you don't have combos as such, but attacking while moving in a given direction provides a lateral slash, or a forward lunge or whatever. Different weapons also mean different attacks – Riddick's signature curved blades are very different from, for instance, a lead pipe.

The fighting is nasty. Multiple stabbings, throat-slashes, groin strikes... it's all there. But once you get caught up with multiple opponents, the game gets more frustrating than rewarding. Some of the sequences, especially the killing blows, are quite time-consuming, and it's highly annoying to be locked into an otherwise entertaining evisceration while another NPC beats on you from behind.

There's some ranged weaponry available, but lack of ammunition means you'll mostly be sneaking for much of the game's early levels. Things open up later, but the highly challenging early levels may be a bit hard to get through.

What kept us going was the story, however, and excellent pacing reveals the larger world that Riddick is sneaking through. Pitch Black
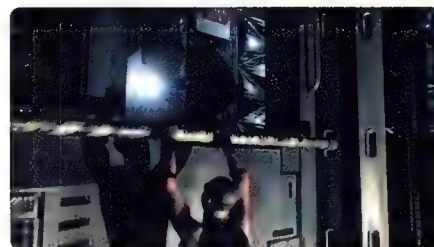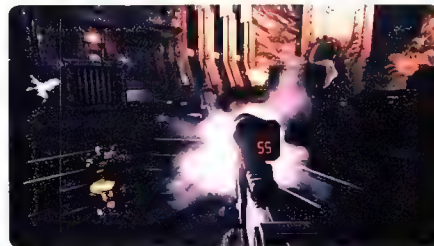
worked as a film because it dropped you in the middle of the action, with no text crawls or overly explanatory narration. The game does much the same, and it means you play on to see what the characters will do next, as much as to get to the next cool fight.

Dark Athena doesn't quite live up to the game before it, but it's still an awesomely fun romp. It's a nice change to play a character who is, in many ways, a bad guy, and the writing and voice acting does a great job of setting up the world at large and Riddick in particular. With Butcher Bay thrown into the mix, it gets even easier to recommend despite some issues. **DH**

360, PS3, PC (reviewed on PC)

Developer **Starbreeze Studios**
Publisher **Atari**
Website **www.riddickgame.com**

Graphics
Pleasingly atmospheric, with good injury modelling.   **84**

Gameplay
Frustrating at times, elegant at others.   **76**

Sound
Solid voice-acting, immersive effects and music.   **93**

Overall
Very good value, and more than worth some minor gripes.

81%

Resident Evil 5

Zombies x Speed = win.

The fifth game in the Resident Evil series (known as Biohazard in Japan) is a direct continuation of the storyline from the fourth game, re-imagined for next-gen consoles. First though, we'll summarise the history of the game so far; a pharmaceutical company called Umbrella created a virus that killed and then re-lifed the inhabitants of Raccoon City. The only problem was that they were a little, well, *deadish*. A series of unfortunate mishaps later, and the remnants of that accident were eventually swept under the carpet until Resident Evil 4. Leon Kennedy fought against entire European villagers who had been zombiefied by the Las Plagas: mind-controlling parasites of doom.

Resident Evil 5 begins years after the events in Raccoon City, as Chris Redfield takes on the history left by others in the series, as part of the Bio-terrorism Security Assessment Alliance, or BSAA. Apparently founded by the pharmaceutical company that came around after Umbrella failed, he's sent to Africa to look for... something, and meets up with his partner Sheva Alomar. You can choose either character to play through with, and even do online coop with a friend.

We had high expectations for this game, and as we fired it up and saw the title screen (complete with suitably scary voice) our excitement was piqued. It's running a custom-built game engine that has incredibly good effects, from the harsh sun beating down overhead to the

dry yellow grass clumped around – it looks the part. Being in HD gives a lot more detail too, and every environment seemed believable.

The camera is one of the most important changes about the game – it's pulled back to an uncomfortable angle over Chris' shoulder, only changing to look directly ahead when aiming your weapon. You can't shoot and walk, so this cramped camera really heightens the sense of being surrounded at all times, and choosing to fight or run always causes your heart to race.

Voice acting doesn't add to the atmosphere however, with the two main characters interacting with each other with more stiffness than a triple-reinforced girder coated in concrete. The script is basic, leaving the story to be discovered through notes left lying around the game world (oddly all on clipboards, in very neat print). Being the zombie-survival-horror genre, ammunition is always a concern – but it seems that here it is always hanging around if you take the time to look. We can count the amounts of times we ran out of ammo entirely in double digits; not a fun experience to run around to hope you can find some and live.

In previous games there have been only one or two zombies at a time, and they've always shuffled slowly towards you, almost leisurely. Resident Evil 5's zombies, known as Majini, have the delightful tendency to sprint at you, throwing bottles or axes, and generally hurt you – lots. They are never alone, and you can be facing up to ten of them at a time – it is hectic, and the relentless pace never dies down the entire game. There are no 'cheap thrills' here; you'll actually be worried about how you're going to manage to have enough ammo to kill all the damn zombies!

Missions are quite varied, from simple rescue missions all the way to boating around a lake in an Airboat, and there's enough change to make it feel fresh. The lighting is used to incredible effect in multiple sections of the game, and

you're always pressured to move ever onwards and forwards. Sound effects are functional, but there always seems to be high-pressure music playing even when you've killed all the zombies around. It's also incredibly linear, leaving only a little room for exploration.

Not to mention that one time that the AI decided to dump all it's ammo into my last remaining inventory slot, for a gun I didn't have in the middle of a fight. Rargh!

Overall this is a decent addition to the series, and console gamers will love the thrills this game has to offer. **JR**

360, PS3, (reviewed on 360)

Developer Capcom
Publisher Capcom
Website www.residentevil.com/5/

Graphics
Zombie themed realism never got closer than this.
97

Gameplay
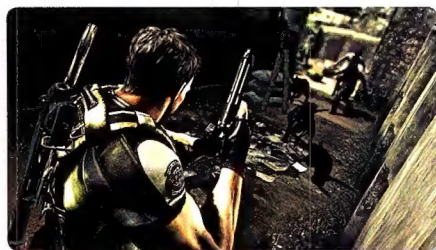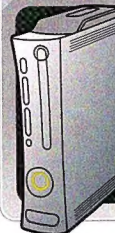Camera can be awkward at first, AI annoying.
86

Sound
Dialogue boring, needs less exciting music once in a while.
79

Overall
One of the most visceral and exciting games you'll play this year.

88%

You gotta laugh

Fun? In work hours? Get outta here...

There's a lot of blood, sweat and tears that goes into making a magazine like this, but even more so when there's as much emotional involvement, as much intensity, as a milestone like 100 issues generates.

But you know what? There's a lot of humour, as well, and I think this has probably been one of the funnier issues to work on.

Take the Atomic Challenge page, on page 43. You would not believe the barney that my designer and I have literally just had over that page. Poor Phil Vella, not quite getting what kind of a mood we get into on deadline, was sending these long emails about how it should look – change here, move this, it should look more like X...

I was in the middle of responding, when I spotted that Designer Dave already had. 'no'

That's was all he said. I simply added, "Master of brevity, right there."

We nearly fell out of our chairs laughing.

I was amused by the Hot 100 Poll, too. When I said that it was simply too close to call, I was more or less telling the truth, but for one exception – 'me' received about 20 times the votes of any other Atomican. I very nearly ran with that one...

And seeing Takoma vote for the 'ignore Takoma' meme on the forums as his favourite thread made me laugh, too.

Mind you, it could have been worse – Logic Probe might have scored Most Popular Atomican. Man, I *never* would have been able to live with myself...

But that's the joy of this place – the humour comes so easy. Everyone who works on Atomic – and there are a few when you consider the guys in Production, or Adsales and so on – really loves it. When people want to take a break around the office, a lot of them come to our little corner. Just to chat and hang out, see what we're excited about.

Even if they don't understand a word of it.

Case in point of that would be the excellent Blizzard ad that's in this issue. One of my poor ad people thought Blizzard had supplied the wrong file, that they'd messed up the text for their own advert! So he had me have a look

at it, and couldn't quite get why I thought it was the coolest thing ever. So he came round to get me to explain it.

I ended up having to explain World of Warcraft, chat channels, the meaning of the word Ding!, what the importance of levels is in an MMO, and then what Gratz means. It took

about ten minutes, and then he went back to look at the ad.

"Nah," he said, "still don't get it."

"It's okay, mate," I said. "You're not exactly the target market."

But you guys are – and that's what counts. **DH** (°•)

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PCS HD 4670

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Engine Clock: 750 MHz
Memory Clock: 873 MHz x2
Memory Interface: 128-bit
Direct X® Support: 10.1

Professional Cooling System

10°C+

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Memory Interface: 128-bit
Direct X® Support: 10.1

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